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CARNEGIE ENDOWMENT FOR INTERNATIONAL PEACE
DIVISION OF INTERCOURSE AND EDUCATION
PUBLICATION NO. 11

HYGIENE *and* WAR

Suggestions for Makers of Text-books and for Use in Schools

BY

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Published by the Endowment
Washington, D. C.
1917

v. 11
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UNIVERSITY PRINTING OFFICE
COLUMBIA UNIVERSITY

FOREWORD

The chief purpose of this and related pamphlets in literature, arithmetic and geography is to present to the school children of the United States materials showing the futility and burden of militarism and the destructiveness and barbarism of modern war, or materials relating to the heroism and patriotic services of deeds of everyday life. The accomplishment of this purpose is sought through two means:

First, it is hoped to interest text-book writers in the feasibility and desirability of incorporating some of the materials published in this pamphlet, or materials of a similar nature suggested by them, in the text-books to be written for our schools.

Second, awaiting such more or less remote results, it is sought to place in the hands of the teachers of the special subjects in the schools the appropriate pamphlets that they may use them in their regular class instruction. There is no desire to deny the heroism called for by war or the necessity of the patriotism and the sacrifices demanded by war. Yet it is hoped to develop a broad and tolerant conception of patriotism and higher idealism through the incorporation of the matter suggested into the materials of instruction.

The materials of this pamphlet were collected a year or more ago, so that much of the information resulting from the experiences of the present war was not available. Since publication, our own country has become involved in the world-wide struggle; but as the pamphlet contains so much material that is of value in time of war, its circulation has not been withheld.

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407 WEST 117TH STREET
NEW YORK CITY

AN INTRODUCTORY STATEMENT

By WILLIAM H. BURNHAM
Clark University

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HYGIENE AND WAR

By GEORGE E. JONES
University of Pittsburgh

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HYGIENE AND WAR

AN INTRODUCTORY STATEMENT

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The effects of war upon hygiene are as follows:

1. War emphasizes certain essential hygienic precautions.

2. War contributes to hygiene the discovery of certain important sanitary measures, methods, and devices.

3. On the other hand, war causes a serious setback to the battle which hygiene is constantly waging against the enemies of man's health.

Much evidence upon each of these points has been furnished by the present great war. The data available are inadequate; but it is reasonably clear from the facts obtainable that the interference with general hygiene resulting from the war far outweighs the direct contribution furnished. Possibly after peace is established, however, the need of hygienic measures will be demonstrated so clearly that a great advance may occur, in part compensating for the terrible setback due to the war. The three points mentioned above may well be especially emphasized. Dr. Jones has studied the data bearing upon each, and attempted to present the facts.

THE EMPHASIS ON HYGIENE

The war puts a tremendous emphasis on the need of hygiene; and military hygiene offers many lessons to general hygiene. Modern study has shown that those trained in habits of health and cleanliness have a great advantage in war. Victory does not lie now, as largely in the past, with pestilence, but with soldiers trained in mental and physical hygiene. It appears that the requirements for a good recruit and a good soldier are much the same as the requirements for business occupations,

that the same elements largely have to be considered in the choice of the soldier as in the selection of a workman; and we may add that good teeth, good digestion, cleanliness, and habits of healthful activity are alike valuable for the soldier and for the artisan.

Again, a vast war literature bearing more or less upon health has appeared; and thus, while the conditions brought about by war have been a serious setback to hygiene, they have contributed on the other hand, a certain emphasis on the need of hygiene.

HYGIENIC DISCOVERIES

Some important contributions to hygiene have resulted from the war. For example, attention has been given to food and the formulation of rules in regard to simple and nutritious and economic diet. This has included rules not merely in regard to food, but also in regard to the use of beverages; and important reforms in the use of alcoholic drinks have been advocated and begun.

It is customary to point to the fact that a war contributes largely to hygiene because of the discoveries made in regard to hygienic methods and devices; and it may be pointed out that had it not been for war we might not yet have discovered certain important hygienic truths, possibly the value of some of the best disinfectants, and the like. Moreover, the great contributions to hygiene resulting from the necessities of camp life are not at all to be underestimated. But however valuable such results have been, science does not need the crude experiments of war to determine hygienic truth at present; for the laboratory with controlled experiments gives far better opportunities for hygienic research.

Further, it appears that the school hygiene developed in the last fifty years is now receiving its crucial test and proving its worth. The excellent condition of the men in the field is due largely to their school training. War is proving that hygiene taught and practiced in years of peace shows its effect in time of war; and further, the war proves, contrary to the opinion

of some, that the youth of today are not weak and effeminate, although perhaps they are more sensitive than those of earlier generations.

Thus war puts an emphasis on the need of hygiene; but peace is necessary to develop the art of hygiene. The stress of war suggests certain hygienic measures, but peace is necessary to give them general application. War sometimes shows the importance of changes in modes of life, but peace again is necessary to habituate people to these changes.

MAN'S PERENNIAL CONFLICT WITH DISEASE AND ITS SETBACK BY THE WAR

Perhaps this last point, the interference of war with general hygiene, is the one most likely to be ignored or underestimated, because few people realize the significance of the war continually waged by hygiene against the enemies that threaten the health of human beings. Mr. Ealand, in his new book, *Insects and Man*, has described this interestingly and vividly, and has shown in much detail the conditions of the warfare on this planet between man and his enemies in the insect world. Mr. Ealand goes so far as to maintain that the outcome of this great war between man and the arthropod is nearly as much in doubt as the result of the present European conflict; and he even suggests that it is almost a toss-up whether man or insect will ultimately have possession of this planet. Whether or not he exaggerates, there can be no question about the seriousness of the situation. The vital importance to mankind of this great hygienic warfare may be shown by noting some of the facts presented by Mr. Ealand. I shall quote from Mr. Johnston's striking summary [1] of this book as well as from the original.

Mr. Ealand has shown the immeasurable damage done by insects, especially in conveying disease, and the necessity for the whole human race to engage in the great warfare against these common enemies. This is what Mr. Johnston calls the next war, although it is really a war already waged for many years.

[1] In 19th Century and After, July 1915.

A war to be waged, not between man and man, but between Man on the one side and the Arthropod on the other, a war to be fought to the finish to decide which of the two forms of life, this highly developed vertebrate, or these malignly evolved invertebrates, is to govern our planet. Is the lord of this earth some day to be a monstrous ant or bug, a wasp or a midge, a scale-insect or a tick—or is it to be this godlike mammal who walks erect and can see the stars and weigh the suns and planets, who is already in touch with the supra-mundane universe?

The *Sporozoa* and *Flagellata*—micro-organisms at the base of the animal kingdom—and the *Schizomycetes*—vegetable germs of single cells commonly called bacteria—are the direct causes of nearly all the diseases which afflict humanity. And the elimination of these depends upon the elimination of the insect carriers that disseminate disease by introducing the germs into the skin, the stomach, or the veins of man and other animals, and the tissues of plants.

It should be remembered that recent investigations have shown that without the Anopheles mosquito, there is no malaria; without the Stygomia mosquito, there is no yellow fever; without the Tse-tse fly, there is no sleeping sickness; and without ticks, fleas, and the like, probably the plague and several other diseases would be exterminated. Without the housefly, typhoid fever would be easily controlled; and if it were possible to destroy the harmful bugs, scale-insects, aphids, and the like, the plant food of the world would be enormously increased.

As Mr. Ealand points out we have certain allies also in the animal world, especially the birds, and next to the birds, lizards and fresh water fish. Even among the insects themselves we have some important allies, the various parasites that attack and destroy other insects. Especially noteworthy are the little beetles called lady-birds, or the *Coccinellidae*. As Mr. Johnston summarizes Ealand's facts:

There does not seem to be a 'bad' lady-bird from Man's point of view; for the *Coccinellidae* have apparently come into existence for the purpose of attacking and exterminating the multiform caterpillars, scale-insects, aphids, beetlegrubs and frog-hoppers which devour our food crops, our fruit and foliage trees, our tobacco and our melons. Each precious plant

or tree in this category seems to have its tutelary saint among the *Coccinellidae*, and one can imagine in the coming age of knowledge (the millenium which shall follow the present War) grateful cultivators erecting shrines and tablets in honor of this or that lady-bird protector of their crops. The Beetle order—besides the *Coccinellidae*—contributes another family to Man's allies; the *Carabidae* or ground beetles, nearly all of which are carnivorous and addicted to attacking and devouring chiefly other insects, mainly in the larval stage. They even by some extraordinary instinct prefer the female larvae (in some instances), thus destroying with a nip a possible mother of thousands. Many of the Carabids devour the obnoxious termites in tropical countries. But the genus *Calosoma*, which happens to be beautiful as well as right-minded, is worthy of international recognition as the inveterate enemy of the Gipsy moth, that ghastly plague of the Eastern United States—a destroyer of noble trees and apple orchards.

Many of the other insects are man's allies, *e.g.*, dragon-flies, ant-lions, and many wasps; and even a few of the ticks are helpful, as well as certain fungi and bacilli which can be used as insecticides. But the majority of insects and ticks are in direct conflict with the interests of mankind.

Mr. Ealand speaks of the thousand and one ways in which the activities of man and insects harmonize and of the mutual benefit that they are to each other, and he also speaks of the many ways in which a war to the death for supremacy occurs. In part he says:

It is fortunate for man that the insect world is a house divided against itself; except for this check the human race would be extinct in five or six years. The fecundity of many insects is enormous; Huxley estimated that, mishaps apart, a single green fly would, in ten generations, produce a mass of organic matter equivalent to five hundred million human beings, or as many as the whole population of the Chinese empire. From the earliest times man has suffered from insect damage to his crops, his live stock, and himself. Locust plagues, rivalling those of Egypt, have come to man from time to time. Pliny mentions them; they visited Ukraine in 1645, and America at the close of the Civil War; a vast swarm two thousand miles in extent crossed the Red Sea in 1899, and eight years previously one thousand three hundred tons of locust eggs were destroyed in Cyprus alone. But this is not all; the United States suffers damage to the extent of $40,000,000 owing to the depredations of the Hessian fly; the cotton-boll weevil causes an annual loss of $30,000,000; the codling moth $15,000,000, and the chinch bug $7,000,000; add to this the damage done by gipsy moths and brown-tail moths, and the San José scale, to say nothing of a host of minor pests, and the total assumes alarming proportions.

Professor Arthur Shipley of Cambridge, in a paper before the Royal Society of Arts, has presented a similar view, pointing out that insects have helped to destroy famous civilizations and that they constitute a real peril today to the armies operating in Asia and Africa. These insects which affect man in times of war are those which affect him also in times of peace, but in war time their effects are likely to be more violent and more persistent.

Of the present war Mr. Johnston writes:

> The frightfully damaging part that can be played by insects in all the crises of humanity, in all extraordinary conditions of life, is brought home to us by the present war. The drawing together of men from the humblest habitations in the kingdom has caused the comfortable-living amongst the middle and the upper classes to realize our national crime in having so long tolerated the shocking housing conditions of the mass of our people. The decently clad, decently brought up clerk, who perhaps has never given a thought to the life of the agricultural laborer or the mill hand, realizes when packed into a tent with eleven other men, who have gallantly left the plough or the factory to risk their lives for the upholding of their country's interests, that the picturesque country cottage or the vile city slum still tolerated by our farmers and our smug city fathers, swarms with bugs and lice and fleas; that life under these conditions (often with a wretched water-supply and no means of maintaining proper personal cleanliness) results in able-bodied men and women being carriers of bugs, fleas and lice, either on their persons or in their garments or belongings. Immediately following this discovery comes something far worse than sleepless nights from the attacks of vermin, comes illness—perhaps death—from insect-conveyed diseases. This misery of vermin will at any rate stand out prominently among the many forms of wretchedness caused by the present War.

The indirect loss to hygiene can hardly be overestimated. The war has turned us aside from the warfare against our insect enemies. In Europe, at least, forces that should be united in fighting the common enemy are now divided, fighting against each other. The most stupendous loss to hygiene has come in this indirect way. The enemy, taking advantage of the divided forces opposed to it, has attacked mankind all along the line of the war in Europe. In meeting these attacks some new and valuable methods have been developed, but the common enemy has gained ground enormously as indicated by the records we have.

Another way in which the war is likely seriously to hinder the warfare against disease is that it is hard on the insect-destroying birds. Not only do many of the soldiers in their leisure hours shoot the birds, but the continual firing of artillery and the like is particularly bad, for it destroys large numbers and frightens away others. The details of this have not come to hand, but clearly it is a serious evil.

However great the emphasis that war places upon the need of hygiene, the actual development of hygiene requires a time of peace. The progress even of military hygiene, although stimulated by war, has been possible only in times of peace. The study of typhus fever, typhoid, and so on, was made not in war time but in peace; yellow fever was investigated, conquered, and driven out of Havana, New Orleans, and Panama during a period of peace; and likewise the conquest of malaria and other diseases has been a victory of peace rather than of war. Peace is necessary also because the warfare against our insect enemies, as has been shown by the reports of Col. Gorgas from Panama, must be continuous. Apropos of this it is said:

> The battle with nature is unending, and the slightest relaxation means reversion . . . Special and exceptional problems are being constantly presented, due in many instances to the engineering work connected with canal construction. Swamps of large area are sometimes unavoidably created, and before drainage can be effected, breeding of *Anopheles* has assumed formidable proportions. . . . The great Gatun lake, with its approximately two hundred square miles of area and hundreds of miles of rugged shore line, bids fair to offer many problems as its level continues to rise. In the sheltered bays and indentations of its shore line aquatic vegetation riots and, as the waters inundate the tropical forest, a condition is created ideal for the most prolific breeding of *Anopheles* and other mosquitoes—a tangle of living and dead vegetation, with floating débris from the dying trees, among which water plants flourish.[1]

The Direct Loss to Hygiene.—Something should be said, too, about the more direct hygienic loss from war. Not only has the present war handicapped us in our warfare against disease, but there has been a very direct loss; in the first place, because

[1] Cited by Ealand, p. 91.

in the stress of necessity soldiers and the citizens in general have felt that they could not take the time for many hygienic measures; in the second place, because the money and equipment that in times of peace would be devoted to hygienic investigation and sanitary improvement have been utilized for military purposes; and in a hundred more concrete ways there has likewise been a serious direct loss.

Again, so many physicians and nurses have been called to the front that the medical care and sanitation of schools and the like are being neglected, although it is more important than usual that proper hygiene be practiced at home.

Finally, the facts show the fallacy of those who deem war a helpful factor in biological evolution because it is supposed to ensure the survival of the fittest. Many rash and foolish statements have been made in regard to the effect of war on the human race. Even the advocates of eugenics have not been free from error. While noting some of these errors, our study has shown the serious evil that results from war in the destruction of the fittest among the population, both men and women.

The data available indicates that the entire population of countries at war suffer. And Dr. Jones concludes that the number of deaths due to worry, overwork, deprivations, and the like, among the women, children, and others left at home, approximates that of the army.

Hygiene When the War Ends.—Again, the progress of hygiene is retarded by war, because the vast number of cripples and invalids make the problems of hygiene much more difficult. And it is now recognized by physicians and hygienists that special preparation must be made for avoiding the evils that will follow as a result of the war. The Canadian Public Health Association and the American Association for Public Health have considered this subject in their recent meetings. And, as President Jordan has pointed out, the lands engaged in war must, if they are to recover from the struggle, take better care of their people in the future than they have been wont to in the past.

The health departments after the war must take up new lines of activity and do more and better work. It has been pointed out that one result of every war in the past has been the increased number of unfit houses, and the multiplied number of people living in such houses. The vast army of cripples and those disabled in different ways find their way after a war into unsanitary homes, because they can be had for a low rent. It is stated that when a family has lived in a tumble-down house for two generations it would not live anywhere else. Such a family would not live cleanly and hygienically even if placed in a palace. The bad house and the bad district affect the mental and moral tone of the people when they have been subjected to it for more than a generation. Thus it is already recognized by the Canadian health officers that the towns and cities must try to offset the effects of the war by preventing this bad housing after the war is over.

It is well to consider also what will be the effect on this country when the war is over. We must surely expect that in Europe at least taxes will be enormously high. In many cases the burden will be too great for the people to bear. Naturally many will emigrate to this country where it is possible, and we may naturally expect a vast influx of immigrants at that time. This makes it doubly necessary that we should take precautions that the feeble-minded and criminal may be kept from coming to our shores, and that proper sanitary measures may be taken to keep out cases of infectious diseases, and the like.

One point is of such vital importance that it may well receive the attention of every Board of Health, namely, the problem of protecting communities from infectious diseases that will be brought home by the sick soldiers at the close of the war. With the large number of immigrants sure to come to this country, this is a problem for the United States as well as Europe. Especially serious is likely to be the danger of infection from venereal diseases. One concrete example must suffice as illustration of the precautions that can be taken. Australia has already passed a drastic act in

regard to venereal disease, requiring compulsory examination and treatment, and providing severe penalties for failure to comply with the law.[1]

Hygiene and the Larger Problems of the War

Some of the larger problems connected with the war also have their hygienic aspects.

Years ago Professor James, ardent peace man though he was, warned us that a millennium of peace would not breed the fighting spirit out of our bones, and suggested a year of service in various forms of drudgery as in part a possible substitute for war. More recently Professor Cannon has suggested football, and Professor Patrick, sport in general, as a substitute or prophylactic against the most brutal manifestations of the warlike instincts.

While we attempt to develop mutual understanding and sympathy as the natural means of controlling the impulse to war, mental hygiene emphasizes also the advantages of such means as are suggested by James, Patrick, and Cannon. Any permanent interest in peaceful activities will be helpful.

As one of the best outlets for the so-called fighting instinct and a natural substitute for war, the writer would suggest enlistment in the warfare against the disease-carrying insects, as well as the greater development of the hygienic side of the soldier's training.

While this hygienic warfare is not so spectacular and does not at first appeal so strongly to the youth as military warfare, it would not be difficult for tactful teachers to stimulate an interest in this conflict. Not merely can the importance and practical utility of it all be shown to the young, but it would even not be without appeal to the instincts of chivalry and romance. That it gives opportunity for protecting one's friends from sickness and death, that it is service of the most significant sort for women and children and the weak and defective, make such warfare appeal even to the higher altruistic instincts.

[1] Jour. of Amer. Med. Assoc., Sept. 2, 1916, p. 757.

There is a widespread effort to substitute the literature of peace—the history of its victories and achievements, even its hymns—for the literature of warfare, which so largely makes up the historical and other reading of children. All this is an excellent movement; but the advocates of peace, if they would be successful, must adopt a psychological method. There is no question about the interest that boys and girls have in the accounts of battles and the zest of conflict. But this is rooted in a deeper and more fundamental impulse, the impulse to activity. Children and youth are always interested in vigorous activity and the mastering of difficulties. Any form of strenuous activity, as soon as associated with healthy rivalry, hearty co-operation, and the romantic halo of success, becomes a matter of intense interest. To develop an interest, it is necessary only that one act frequently on the basis of these fundamental impulses. If the monotonous routine of the soldier's life, the hardships, the difficulties, the endless repetition of daily tasks, the inevitable marching and drilling—'Boots, boots, boots, moving up and down again', as Kipling puts it—the ever-necessary hygienic precautions, the wearisome sanitation, the occasional opportunity to encounter danger, to make personal sacrifice, to come to close quarters with the stern realities of life—if all this for the real soldier has the zest of interest and romance, it is because the interest is based on the fundamental impulse to act and to overcome difficulties, and the activity has acquired a halo of associations connected with the other individual and group instincts mentioned. The so-called fighting instinct plays but a minor rôle here.

The warfare against disease gives opportunity for appeal to the same fundamental instincts. If at present such occupation seems vapid and dull, it is because it is judged from the outside, where as yet there is no beating of drums, no manual of drill, no organized hierarchy of grades, no insignia of rank, no official rewards, and the like. But those who have actually done work of this kind, who have actually engaged in this warfare against disease, have found the same or higher inter-

ests and rewards. Even the incidentals of occasional opportunity to encounter danger and to use one's wits in invention and strategy, as well as opportunities for sacrifice and devotion, are not lacking. Those who enter the service acquire the interest.

Moreover, literature in regard to man's warfare against disease contains much material that appeals to adolescent interest. The romances connected with the warfare against malaria, yellow fever, and the like, are as thrilling as the stories of battle. The victory over the enemy, the discovery of the enemy's methods of warfare, the devices for overcoming the enemy, the plans of campaign necessary for success in this warfare, the tragedies that may result from a slight mistake—the escape of a prisoner or the like—are well nigh as interesting as similar episodes of the warfare between nations or between man and man.

As a single illustration take the old story of the introduction of the gypsy moth into the United States. Professor Trouvelot of Harvard in 1869 was experimenting with the European gypsy moth. The care of the jailor was not equal to the dangerous character of the enemy imprisoned. According to the story, an egg was blown from his study window or one of the caterpillars escaped from his prison. Professor Trouvelot at once warned the public that a dangerous insect was at large, but his warning was not heeded. People took little notice, the insects were seldom seen; they increased at first slowly, but in a dozen years they had a death grip on the trees of Massachusetts, and the enormous cost to the state and the country from the warfare against this insect is all too well known. It is still devastating the trees of the country, and the fight against it must still be carried on for years with enormous expense.

Hygienic Training as an Essential of Preparedness

At the present time everybody is talking about preparedness. The vital question is what form of preparedness is efficient and worth while. For most of the situations of life,

especially for most of the crises of life, the only preparedness of prime worth is a moral preparedness. This truth, valid for the crises of nations as well as those of individuals, has received noteworthy illustration during the last three years.

For instance, let us take the case of France. In 1870 France was unprepared from both a military and a moral point of view. The result is well known. The French were beaten. Then in its humiliation the country organized its great system of modern education. Since that time the schools have attempted not only to give an education of scholastic and intellectual value, but to give moral training. In place of rivalry and individualism as goals they have set up self-emulation and the development of the spirit of coöperation. This has been carried to a considerable degree even into the details of school life. For example, each pupil has his *cahier historique*, a little notebook in which all that do well have the privilege of writing a lesson each month which shall be a record of school progress and development. The children are told that this little book will be a history of their school life, and that each month they should try to do better than they did the preceding. They are directed also in their school work not merely to think of themselves, but to try to work with their fellows. Thus has the spirit of self-emulation and of cöoperation been made the aim of school training.

All this training for forty years has borne fruit. In 1914, as in 1870, France, although it had a large and well-trained army, was not properly prepared from a military point of view, and the first months of the war had to be devoted to this work of preparation. In 1870 France could not make this preparation after war began, and hence Paris was taken, the French defeated. The reason that the French were able to make preparation after the war began in 1914, able to turn the battle of the Marne and check the invaders, was largely because in this later crisis they had a moral preparation which was lacking in 1870. One who knows something of the history of French education during the last forty years, and of the attempts that have been made to give moral train-

ing in connection with school work, can but believe that a large factor in this moral preparedness which has enabled the French successfully to check invasion and to control themselves so admirably as to win the praise even of their enemies, is the influence of education since they had the good fortune to be defeated in 1870.

A somewhat similar example is furnished by the earlier history of Germany, now unfortunately too often forgotten. In 1806–1807, when Prussia was humiliated by Napoleon, Fichte and the German emperor appealed to the German people telling them that they must make up in the intellectual and spiritual field for what they had lost in the material world. The Germans took this advice; and from that time dates the remarkable development of modern German science and education.

The period following a great war is the great opportunity of education for the vanquished nation. It is often a time of misfortune to the victors. This was largely so with Germany after its victory over the French in 1870. It would be out of place here to enter into any discussion of the relative merits of the contestants in the present war; but from an educational point of view it is fitting to quote from a careful observer, a German, an ardent lover of his Fatherland, and a fair-minded writer—Professor Francke of Harvard—who points out some of the unfortunate developments in Germany in recent years.

Francke refers to the spirit of superciliousness which he says has developed, especially during the last twenty-five years, in the ruling classes of Germany.

> The manifestations of this spirit, he says, have been many and varied. In German domestic conditions, it has led to the growth of a capitalistic class as snobbish and overbearing as it is resourceful and intelligent, counteracting by its uncompromising *Herrenmoral* the good effect of the wise and provident social legislation inaugurated by Bismarck. It has led to excesses of military rule and to assertions of autocratic power which have embittered German party politics and have driven large numbers of Liberal voters into the Socialist ranks, as the only party consistently and unswervingly upholding Parliamentary rights. In Germany's foreign rela-

tions it has led to a policy which was meant to be firm but had an appearance of arrogance and aggressiveness and easily aroused suspicion. Suspicion of Germany led to her isolation. And her isolation has finally brought on the war.[1]

Reverting to our main point, in this country it is practically impossible, probably in every country it is largely impossible, to have adequate military preparedness. As soon as a dreadnaught is built it begins to deteriorate. As soon as a submarine is built a better form is invented. As soon as a superior form of armor is devised a more powerful explosive is invented. And with the enormous boundary lines to be defended in a country like this, adequate preparation is impossible without making a large part of the country a military camp. No one desires this; and hence adequate military preparedness is out of the question.

The most important essential in the preparedness of this nation is thus a moral preparedness which will enable the people quickly to fit themselves for any new situation or any crisis when it arises. Moral preparedness is necessary for peace as well as for war. Such preparedness every sensible man must approve. Why then can we not turn from our futile discussion of militarism and quarreling about the number of soldiers and munitions of war that should be provided, to consider in some degree the far more essential form of preparedness which has stood the French in such good stead, and which alone can save a nation in time of storm and stress.

The duty of the public schools in regard to the training of citizens capable of becoming good soldiers in case of need has been frequently emphasized. How far military training as such should be given in connection with the schools is a problem whose discussion does not concern us here. It may well be noted, however, that while military training does not seem in harmony with the functions of the school, a large part of the training essential for the soldier is precisely that essential in the training of the efficient citizen and of the hygienist who can engage effectively in the world-warfare against disease.

[1] From the *Atlantic Monthly*, Oct. 1915, p. 559.

Four things, all must agree, are essentials in adequate military preparation.

1. A good physique and hygienic personal habits in the individual soldier. A large part of the training of the soldier at present consists in physical and hygienic drill.

2. The ability of the individual soldier to coöperate with others and to obey orders.

3. The ability of a country to support itself, to provide within itself all the essentials for its life.

4. Adequate military preparation, including the ability to manufacture the necessary munitions of war.

Three of these are essentials for the welfare of the country in times of peace as well as in times of war. The public schools do not at present adequately provide for them. One of these, physical development and training in hygiene, is as essential for preparedness against the common enemies of our health as against any nation that may attack us. While proper training in obedience and the development of the spirit and ability to coöperate are not without hygienic significance, we are concerned here with special training in hygiene.

The significance of preparedness can be seen only from the hygienic point of view. The original recommendation made by President Wilson providing for an army of 250,000 and a guard of 400,000 represents only a very small part of real preparedness. His guard meant merely one federal policeman for 250 of the population; and the number of warships, submarines, and the like recommended would be far from adequate to defend our coasts in case of real war. All this direct preparation for warfare represents only the more superficial aspects of preparedness. Back of all this and deeper than all this is a preparation that must go on for years in the development and training of the citizens of a country.

The importance of this training in personal hygiene for the soldier receives notable illustration in modern warfare. Sick soldiers win few battles. In the past the soldier's most deadly enemy was pestilence. At present hygiene keeps this enemy from being a determining factor. Of nearly 11,000 soldiers

encamped at Jacksonville for three months at the time of our Cuban war some 2,000 or more were ill from typhoid fever, and 248 died from this disease. Among nearly 13,000 soldiers encamped at San Antonio for three months, March-July, 1911, there was only one case of typhoid fever, although at that time there were cases in the city of San Antonio.

Such hygienic preparation is essential. It takes a long time. Since it is necessary for peace as well as for war, it should be earnestly advocated alike by the most ardent peace men and military men. Instead of so much futile talk about points on which we do not agree, let us have at least some action in regard to this vital element of preparedness where all can agree. It is the duty of men of all opinions not to check the present interest in preparedness, but rather to turn it into a demand for actual training, into such fundamental and essential preparation as all intelligent citizens approve. Whatever be our views, all can agree in utilizing this interest and turning it into the proper channels.

Again, let us consider for a moment the dangers connected with the present situation. We cannot ignore the facts in regard to the war and our own duty in relation to them. In all this we are in a twofold danger. In the first place, with the attention centered upon the tragedies of the war, and with the constant reading of details of cruelty and accounts of the killed and wounded, our senses and sympathies are inevitably dulled, and we are becoming little by little callous to the misery of our friends across the water.

Equally serious, perhaps, is the danger that comes from the fact that with attention so largely centered upon the horrors of war we are liable to ignore and forget the horrors of peace.

When in a single year in the city of Boston 45 persons were killed and 852 injured by automobile collisions, where every year in this country there are several thousand railway accidents, when in one of our Massachusetts schoolhouses an accident can occur like the Peabody horror, where children were trampled underfoot and burned to death, and when at all times children and adults are suffering and dying by the

thousands from preventable diseases, we certainly should not expend all our mental energy in thinking of the horrors of war across the ocean.

The horrors of war are unspeakable, incredible, and incomprehensible. Even adults with varied experience cannot grasp their awfulness; it is hopeless to attempt to make children understand them, and if we could, it would be unwise. Here, as in all education, training is better than instruction. In hygiene especially it is true that instruction may itself be unhygienic. How, then, can training be given?

We cannot take our pupils to Europe and have them visit the hospitals and trenches, as Camp Fire Girls and Boy Scouts, but a significant amount of training in addition to what has been suggested above can be given in the school in the way of giving opportunity actually to do something in the way of preparing bandages for the wounded, or the like, where such activities are practicable. But still more significant as training and instruction, attention can be called in the schools to the horrors of peace, perhaps equally dreadful although less spectacular. Along with instruction in regard to precautions against fire, against accidents from teams, cars, and automobiles, against infectious diseases, pupils may well have training in fire drills, in intelligent coöperation in meeting difficulties, in removing obstacles that may retard the quick emptying of the schoolroom, in guarding younger children from street cars, and in coasting and the like; training in first aid to the injured, some drill in the cleaning and bandaging of imaginary and real wounds, methods of resuscitating the drowning, and general training in the essentials of personal hygiene; and most important of all, training in healthful habits as regards others—the avoidance of coughing in the face of one's companions, or any other behavior that might carry infection. With the teaching that disease is seldom air-borne, but is usually conveyed by direct contact with a diseased individual or by such carriers as mosquitoes, flies, and the like, there should be training to avoid every means of transmitting infection, and training to destroy the common carriers of disease.

We must face the facts in this world: there is trouble and misery and we are beset with obstacles. The attitude of facing difficulties should be developed; and one who attempts really to overcome the difficulties of life acquires an interest in the conflict itself; the zest of the fight becomes worth while for its own sake. This is one of the great lessons of the present war. In the clash of opinion in regard to just how many actual soldiers and how many warships should be provided this lesson of moral preparation should not be forgotten and neglected.

To develop a young man physically and train him properly in personal hygiene takes fifteen or twenty years. But given young men with well-developed and well-trained bodies, with sound teeth, with well-established habits of health, with proper training in hygiene, together with training in resourcefulness and coöperation, it would be possible in case of need to give in one year the training required to make them actual soldiers.

The means of developing such an hygienic attitude in the young lie not merely in instruction, but especially in the different forms of actual training in hygiene. The practical question is how this training can be given. How shall bad habits be broken and good habits formed? The answer would be a long story. If we once see clearly the aim to be sought, and work for it from the beginning of school life, methods can be devised.

One concrete method may be suggested here. In every school there might be a training class whose special work should be to attend to the hygiene of the schoolroom and of the individual pupils. Such a class would be of distinct service to the school itself; but to the members of the class it would be of peculiar value developing an hygienic conscience and giving actual training in hygienic measures. What is meant may be made clearer by an illustration.

Recently I visited a little rural school of excellent character. The teacher was intelligent, sensible, interested in her work. She had splendid discipline without any apparent show of

authority. The children were bright, helpful, obedient, active, ready to play hard at recess, ready to work in the schoolroom. But apart from the admirable discipline and the scholastic training in the matter of studying the daily lessons, the work of the schoolroom seemed to be all instruction with little or no training. That there was plenty of opportunity in this school for training was obvious. The children might have been more careful in their own personal hygiene; their teeth especially were not properly cared for. As regards the schoolhouse, the toilets, although new, were unsanitary; in the schoolroom the curtains shut out the light from the upper half of the window where it was needed; a little later in the season the room would probably be overheated or improperly heated. In general, the sanitary condition could have been much improved.

This school is typical of a large number, probably of most schools, in the rural districts in this country. In such a school a training class in hygiene would find plenty of opportunity for learning. Among its exercises could be included the acquisition of habits of personal hygiene, normal posture, special care of the teeth, care of the school grounds, cleanliness of the schoolroom, the use of fresh earth, if nothing better, in the toilets every day, adjustment of the windows for proper ventilation with regard to the direction of the wind, the regulation of the temperature of the room, adjustment of the curtains, and the like. Membership in such a class should be made a mark of honor, since service is always honorable.

With a tactful teacher such a class would give training that would be far more valuable than mere instruction in hygiene. The school can do little in the way of giving instruction, but it will accomplish a great deal if it develops an hygienic attitude and fosters the acquisition of certain habits of health that will remain permanent after the children leave school. Instruction is good and it is easy; training is better but it is difficult. The past decade has been a period of talk about school hygiene, the next decade should be one of training in school hygiene.

In the secondary school a militia of health could be organized to take the place of the military cadets that now exist in many high schools. Where such cadets are already organized the change could easily be brought about by developing the hygienic part of the soldier's training and minimizing the more purely military part; and all this could be supplemented by the large and valuable literature of hygiene now accessible. In a few schools experiments of this kind have already been tried with good success.

Space is lacking to give illustration in detail of the importance of this training in physical development and personal hygiene; but for a single illustration take the hygiene of the teeth. Without good teeth a man is not a suitable candidate for the work of a soldier. And without proper care of the teeth the soldier has neither normal digestion nor the general well-being necessary for the most efficient service. In the present war this has received noteworthy illustration. Professor Potter of Harvard is reported to have said in a recent lecture at the Forsyth Dental Infirmary in Boston:

> It is no uncommon sight to see squad after squad of English 'Tommies' making their way back to the nearest hospital, in the hope that relief might be obtained from troublesome molars and gums which, after undergoing the terrific hardships in the trenches, have settled into a dull ache and pain, making the life of the soldier next to unbearable and greatly lowering his efficiency as a soldier.
>
> The German soldier, perhaps through the foresight of the long-preparing German nation, is faring the best of any, especially as regards his teeth. For more than fifteen years Germany has been caring for the teeth of its subjects, establishing clinics in the public schools and dental infirmaries in the smaller towns and villages as well as in the cities, and on the whole making sure that no child, especially a boy, is allowed to let his teeth get into that state of decay which would necessarily cause his rejection at the time of a call to the colors.

Thus a large part of the soldier's training consists in physical development and training in hygiene; and to real preparedness it is a long road.

The trouble today is that we lack this moral, physical, and hygienic preparation. Some states and cities are attempting

to atone for this lack by requiring military drill including physical training in the public schools. The people should not delude themselves into thinking that this means real preparation. Much more than this is needed—general training in coöperation, vocational guidance of the wisest sort, physical training, the acquisition of hygienic habits, in a word, thorough moral and physical training.

Conclusion

The terrible emphasis that the present war places upon the need of hygiene and the terrible setback that the war has given to general hygiene cannot be realized from statistics, however convincing; only concrete illustration such as is furnished to eye-witnesses—and in lack of that the concrete pictures given by the journalist—give some sort of idea of what the facts really mean. Mrs. Rinehart has suggested this briefly for the horrors of military life; the facts in regard to sanitary conditions give opportunity for a similar picture on the hygienic side.

"War," she writes, "is not two great armies meeting in the clash and frenzy of battle. War is a boy carried on a stretcher, looking up at God's blue sky with bewildered eyes that are soon to close; war is a woman carrying a child that has been injured by a shell; war is spirited horses tied in burning buildings and waiting for death; war is the flower of a race, battered, hungry, bleeding, up to its knees in filthy water; war is an old woman burning a candle before the *Mater Dolorosa* for the son she has given."

We may add from the hygienic point of view: War is not two opposing camps with their regular routine and admirable sanitary regulations; it is not two camps deprived for a few weeks of their regular rations, and required to do double work with only half fare; but war is a boy dead tired, sleeping in the mud by the wayside while bitten by noxious insects. It is a young man after long marches and fighting kept awake night after night by vermin until his brain and mind give way. It is an athlete slaking his thirst with water polluted

by the deadly germs of dysentery. It is an old man, the survivor of many battles and campaigns, doomed to death by freezing his feet in the trenches, and the deadly results that follow. It is a wounded man who has protected his own wounds from infection by iodine and first aid material, dying from thirst. It is innumerable women and children at home sick from overburden and the lack of ordinary common food, or driven to nervous breakdown by the anguish and worry of a situation they cannot change.

The loss and horror of the present war are so appalling and stupendous that one gives up in despair any attempt to grasp its real significance. It is beyond our comprehension. A single case of individual suffering that we personally happen to know about impresses us more than a month's record of horrors. The most vivid reports, whether fictitious or real, give no adequate idea of the actual conditions.

All this defiance of hygiene we have passed over without special comment; but the significant fact brought out by our study is, as Dr. Jones expresses it, that in hygiene "real efficiency and real achievement are the product of peace and not of war."

As regards hygiene the plain facts strangely ignored are these. Mankind, engaged in a continual life-and-death struggle with disease-carrying organisms, was making noteworthy progress, especially in the cities of Europe and America. A great victory was achieved in Havana and Panama and the key to the conquest of the tropics was acquired. Then the nations withdrew from the common enemy and began to fight among themselves, spending in two years an amount of money sufficient practically to eliminate malaria, yellow fever, and other tropical diseases from the more densely populated tropical centers. The fighting impulse that should find legitimate expression in physical training, in sport, and in fighting our common disease-bearing enemies, is turned to man's butchery of man. The neutral nations, aroused to the need of preparedness, are largely forgetting the prime condition of pre-

paredness for both peace and war, namely, physical health and training in personal hygiene.

The following general conclusions seem justified by the facts collected:

1. War in general, especially the great war at the present time, has made an important contribution to hygiene by emphasizing the absolute necessity of certain fundamental hygienic rules and principles.

2. The war has contributed a few important new methods and devices of hygienic significance, although the larger part of its contribution has been to medicine and surgery. But it should be remembered that the progress even of military hygiene and sanitation, although stimulated by war, has been made for the most part in times of peace. The study of typhus and typhoid fever, the investigation of yellow fever and its elimination from Havana, New Orleans and Panama, the conquest of malaria, cholera and other diseases, were made not during war but in times of peace.

3. The evidence shows that the war has seriously interferred with general hygiene, with the warfare that is continually being waged between man and his insect enemies. When more complete data are at hand the evidence of this will probably be much more overwhelming, but even what is now available shows the serious setback to general hygiene that has resulted in the European countries engaged in the present war.

4. The psychological basis in human character which under certain conditions seems inevitably to lead to war has been in part made clear. But the so-called fighting instinct, as usually exhibited in human beings, is apparently merely a differentiation from the fundamental impulse to activity and self-assertion. Any form of activity developed with similar emotional associations is equally instinctive.

5. Hence a substitute for war can be found. This is suggested by hygiene. It is to be found largely in physical education, in ample opportunity for play, and in hygienic training which provides for suitable periods of rest and recrea-

tion for all classes in society. Besides this, hygiene suggests another substitute, namely, the expression of the fighting instinct in the inevitable warfare which the individual as well as the community must unceasingly wage against the common enemies of human health. The imperative necessity of this warfare, its continual existence, and the rewards that come from waging it, when rightly understood, would give the strongest incentives for the expenditure of all the fighting energy that youth as well as mature men possess.

6. To show the significance of this hygienic warfare and to prepare for it, long and efficient training is necessary. This can be given largely in connection with school education.

7. Concrete methods of such training can be furnished by training classes in hygiene in the elementary grades, by health cadets, a militia of health, in the high school and higher institutions. And all such organizations as the Boy Scouts and Camp Fire Girls should, as they often do, make this hygienic training an especially important feature in their drill. This is the part of military training to be emphasized and developed, and this is important for the soldier whose duty must be to defend his country as well as for the soldier who enlists in the perennial conflict waged by hygiene.

8. Preparation of the citizens of a country for national defense is in large part, probably in three essentials out of four, precisely the preparation that efficient citizens should receive—the training in coöperation, in habits of health and warfare against disease, and in vocational training to enable them to produce the necessities of life.

9. However important the contribution of war to hygiene has been in the past, scientific method has now developed to such a degree that laboratory experiments under controlled conditions make the crude experiments of warfare of relatively little value.

10. The evolution of both military and civic training will be largely in the same direction. More and more the training of

the soldier becomes training in hygiene; and in the near future it may be hoped that the soldier will become a police health inspector and hygienist. And all forms of education and training of youth that forecast the future will place the emphasis on training that will prepare the individual, not only to preserve his own personal health, but to help eradicate the unsanitary conditions that still exist in modern life.

I. INTRODUCTION

Special Hygienic Points.—From a strictly hygienic point of view, this study has brought out the following:

1. The reciprocal effects of hygiene and sanitation upon soldier and civilian in times of war and peace.

2. Suggestive data, especially those brought out by recent wars and military operations (such as work in Panama, Vera Cruz, San Francisco, etc.) which may be applied to the hygiene and sanitation of the general public at *all times.*

3. Sources of material bearing on the sanitary and hygienic phases of war and military life, for compilers of texts, teachers, lecturers, etc.

4. The part played by war and peace in developing the subject of hygiene and putting it into practice.

The fourth point has been covered by Dr. Burnham in his introduction. The first three will be included in the text.

General Conclusion.—But though the topics above mentioned are valuable, this investigation has revealed the following conclusions as most important:

First. *The health and strength of the general population is the greatest preparedness of the nation, not armor, ships, etc.*

Second. *The extreme fallacy of the tendency to give credit to war for incidental and valuable influences and products that spring up as by-products, which would have come in the natural course of events.*

Third. *The inadequacy of war in attaining the purpose for which it is started or supposed to be waged—as economic adjuster or factor; as a promoter of ethics; as a developer of the race.*

Fourth. *The destructiveness and evil influence of war.*

Fundamentals of Preparedness.—It will be shown that the great achievements of military hygiene have been attained and made possible in times of peace, not war. Facts show that the soldier of any given time is the product of the general population—no better, no worse, and that as a fighting engine

his efficiency depends upon the source whence he springs. However careful the military authorities may wish to be, it is impossible for them to maintain conditions that make for health and vigor among the contending peoples under the stress of war, especially if it be long continued.

Limitations Imposed by War.—Such sanitary measures as have been carried on in Cuba, Porto Rico, Panama, the Philippines, Vera Cruz, etc., could not have been initiated, let alone perfected, in time of war. Nor would careful experimentation be possible at such times. The battle against yellow fever was begun long years ago in peace times and in such times finally won. War leaves little or no time for careful investigation of ways and means of preserving and mending men. Such are its brutalities that they may, in truth, blind even the anti-vivisectionist to such a degree that even he will tolerate rank empirical methods, trial and error procedures, that no one would bear in peace times. But positive results come more quickly, more surely and with more permanency under the real experimental conditions possible only in times of peace.

The development of certain industries, such as chemical, steel, etc., needs no such artificial stimulus. The airship is not the product of war. It is the result of the long, patient efforts of such men as Langley who would have had no such opportunities for investigations in war times as peace afforded them.

Importance of Hygiene at all Times.—It will be shown that the careful habits of dress, conduct, eating, sleeping, etc., required of the soldier are quite as necessary for civilian and soldier in times of peace. Facts indicate that because of the higher ideals developed along these and other lines by the volunteer in his pursuit of the occupations and professions of peace, he becomes an efficient soldier more readily when needed. Hence this training in hygiene, obtained in peace times produces positive results. In war its results are negated.

Upon the advent of war, the civilian population is suddenly called upon to readjust itself, to change its food, clothes, habits, etc. Such is the make-up of man, that however will-

ing or desirous of doing this he may be, *he cannot do it.* Data will be presented with reference to the food supply of the German people, showing what is possible for them to do *if* they are able to carry out the plans suggested. Some changes which English authorities think necessary for their country will also be indicated. No one claims that these ideals and admonitions will or can be carried out even reasonably well. Habits of a life time, of a generation, of a race, cannot be changed over night.

Instead of war contributing *solutions*, it merely burdens peace with the problems of finding remedies for its woes.

Inadequacy of War.—For a comprehensive discussion of the inadequacy of war in accomplishing the ends for which it is waged—as an economic adjuster, as a promoter of ethics, as a developer of the race—and of its destructiveness and evil influences, a complete historical treatment might be necessary. But orientating ourselves from the viewpoint of hygiene, simplifies the case. And for this reason we call attention to these points, with incidental contribution to other phases. The factors are so closely related that their influences intermingle, each in turn affecting the others.

So far as history shows, treaties concluding wars show little agreement with the purposes for which the conflicts were undertaken. It is well to recall that our War of 1812 really did not solve the difficulties for which it was waged. The Mexican War left us a heritage of suspicion and hate, the results of which we yet feel and regret. Our Spanish-American War was for the liberation of Cuba, an object which would probably have been attained through peaceful diplomatic procedure had it not been for the jingoism of the press and petty politics among our people. It left us a legacy of more suspicion on the part of our southern neighbors, an island incubus which the pro-militarists ever hold up as justification of unlimited naval expenditure, and an excuse for quarrels in the Orient. Perhaps the investigation of the International Commission of Inquiry into the Balkan Wars indicates, typically, the usual concurrence of cause with effect when war is

the instrument used. Since this investigation represents—what has been lacking so often heretofore—a real attempt to ascertain all the conditions of the contending parties, soldiers at the front and at home, civilians at home, in the territories invaded, refugees, moral conditions, economic, etc., we shall quote at length from it. Undertaken by men as impartial as it is possible for humans to be, careful investigators who verified wherever possible every statement, its conclusions are of vital significance, especially at this time. The members of this Commission visited the various countries involved in the Balkans Wars, talked with men in authority, with the refugees, with the peasants, etc. This was at the close of the second war when, as we shall see, the effects were still vividly present. As we have already shown, actual facts were not obtainable in many cases. In some cases the governments concerned would not furnish them. In others, machinery for their collection was absent when the facts were available. The Commission has carefully made plain the source of their data and properly evaluated it. (194)

The Balkan War was undertaken for the purpose of liberation but, this accomplished, the freed men turned to rend each other! No inquisition reveals greater horrors than were perpetrated by the Balkan nations upon each other. After suffering years of oppression, enlarging bands—perhaps more or less brigand in their nature, especially in the beginning—began to create trouble for the Turks. They gathered sufficient momentum to lead them to form a sort of Committee or 'Organization'. No longer able to endure the oppression under which they lived, a portion of the more radical members of the organization set about through violent measures to arouse Europe to their needs. The Commission says:

> It is the climax of the 'Internal organization' and that of its fall. The heroism of the rebels breaks itself against the superior force of the regular army. The fighting ratio is one to thirteen, 26,000 to 351,000; there are thousands of deaths and, in the final result, 200 villages ruined by Turkish vengeance, 12,000 houses burned, 3,000 women outraged, 4,700 inhabitants slain and 71,000 without a roof.

In a short time the alliance of Servia, Bulgaria, Montenegro, and Greece was formed. With remarkable effectiveness, they soon attained a possibility of the toleration and liberation for which they had contended. At this point they began to quarrel among themselves, with what dire results we shall let the report show. Keeping in mind that this first Balkan War was for liberation, toleration, freedom, let us see how the would-be-freed men act:

> On a close view of what happened in Macedonia, as the Balkan armies marched southward, this War of Liberation assumes a more sordid and familiar aspect. It unleashed the accumulated hatreds, the inherited revenges of centuries. It made the oppressed Christians for several months the masters and judges of their Moslem overlords. It gave the opportunity of vengeance to every peasant who cherished a grudge against a harsh landlord or a brutal neighbor. Every Bulgarian village in northern Macedonia had its memory of sufferings and wrongs. For a generation the insurgent organization had been busy and the normal condition of these villages had been one of intermittent revolt. The inevitable Turkish reprisals had fallen now on one village and now on another. Search for arms, beatings, tortures, wholesale arrests, and occasional massacres were the price which these peasants paid for their incessant struggle toward self-government. In all these incidents of repression, the local Moslems had played their part, marching behind the Turkish troops as *bashi-bazouks* and joining in their work of pillage and slaughter. Their record was not forgotten when the Bulgarian victories brought the chance for revenge. To the hatred of the races there was added the resentment of the peasantry against the overlords (beys) who for generations had levied a heavy tribute on their labor and their harvests. The defeat of the Turkish armies meant something more than a political change. It reversed the relation of conqueror and serf; it promised a social revolution. (194, p. 71)
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> Nor was it only the regions occupied by the Bulgarians which suffered. In the province of Monastir, occupied by Serbs and Greeks, the agents of the (British) Macedonian Relief Fund calculated that eighty per cent of Moslem villages were burned. Salonica, Monastir and Uskub were thronged with thousands of homeless and starving Moslem refugees, many of whom emigrated to Asia. (194, p. 72)

The Turks stated to the Commission that most of these atrocities occurred during the early weeks of the war. And that is as might be expected and as we have found in the present war. The passions do subside as more and more efforts are required for battles, etc. How the oppressed, when

liberated, turn to oppress their opponents is clearly seen in the enforced conversions of the pomaks. (194, pp. 77–78)

The Holy Synod argued that since force had been used to convert the pomaks to Islam, force might fairly be used to reverse the process. The argument is one proof the more that races whose minds have been molded for centuries by the law of reprisal and the practice of vengeance tend to a common level of degradation.

Apropos of the present European conflict and the jingoism being circulated through the American press for the purpose of launching us on a militaristic policy, the following from the Report (Balkan) is significant:

It required no artificial incitement to produce the race hatred which explains the excesses of the Christian Allies, and more especially of the Bulgarians toward the Turks. Race, language, history and religion have made a barrier which only the more tolerant minds of either creed are able wholly to surmount. It is easy to explain the excesses of which Greeks and Bulgarians were guilty toward each other. The two races are sharply distinguished by temperament. A traditional enmity has divided them from the dawn of history, and this is aggravated in Macedonia by a certain social cleavage. But for a year the two nations had been allies, united against a common enemy. When policy dictated a breach, it was necessary to prepare public opinion; and the Greek press, as if by a common impulse, devoted itself to this work. To the rank and file of the three Balkan armies, the idea of a fratricidal war was at first repugnant and inexplicable. The passions of the Greek army were aroused by a daily diet of violent articles. The Greek press had had little to say regarding the Bulgarian excesses against the Turks while the facts were still fresh, and indeed none of the allies had the right to be censorious, for none of their records were clean. Now everything was dragged to light, and the records of the Bulgarian bands, deplorable in itself, lost nothing in the telling. Day after day the Bulgarians were represented as a race of monsters, and public feeling was roused to a pitch of chauvinism which made it inevitable that war, when it came, should be ruthless. In talk and in print one phrase summed up the general feeling of the Greeks toward the Bulgarians, '*Dhen einai anthropoi*' (They are not human beings). In their excitement and indignation the Greeks came to think themselves the appointed avengers of civilization against a race which stood outside the pale of humanity. (194, p. 95)

Importance.—A careful perusal of the American press just prior to the outbreak of our war with Spain will reveal the same

general chauvinism. It is to be regretted that we have no adequate medical history of any war. Indeed, it is but in most recent years that the significance and importance of Military Hygiene has been acknowledged by military men and civilians. Even in the Boer War, certain British officials looked with contempt upon the medical branch of the service. The Japanese (28) surprised (90) the world into a more serious regard for hygiene and sanitation (138). In their Manchurian campaign, they were able, on account of their thorough medical organization and their observance of its orders, to return one-third of their wounded to active service within a month (365). Fifteen hundred and ninety-three cases of cholera were found among 232,346 Japanese troops sent to the field. Upon the return of these troops there were but 37 easily isolated cases and only 205 men were sick over fourteen days after the return. Such excellent results were achieved through the sanitation and hygiene *practiced* by this army. (147, 212, 213, 214, 414, 415)

Recency of Emphasis upon Hygiene.—In the last ten years, the medical staffs of the armies of the leading nations have been revised. Marvelous results have followed. Owing to excellent organization, the Swiss mobilized their army of 300,000 in two days and distributed them to the frontier in from five to six days. During August, 1914, they had but 44 deaths—5 from sunstroke, 5 from delirium tremens, 6 from suicide (mental derangement), 13 from accidents, and 2 from typhoid. They had 7 cases of scarlet fever and 11 of typhoid. (367, 404)

In 1911, vaccination for typhoid was made compulsory in the United States Army and Navy for all under forty-five years who had not had the disease. In 1898, in a force of 10,759 there were 2,693 cases of probable and certain typhoid, of whom 248 died. While in 1911, in a force of 12,802 on the Texas border, there were but 2 cases and no deaths. It should also be borne in mind that sanitation and hygiene received much more attention with the latter than with the former troops. (142)

Major Lelean states that from 1903–1912, the death rate fell to 33 per cent and the total sickness rate to 48 per cent of the same rates for 1855 in the whole British Army. In 1855 the death rate of the army was 88 per cent *more* than that of the general population. In 1905, it was 22 per cent *less* than that of the general population. During six years' experience with 12,000 Indian troops in India, there was but one small outbreak of cholera, while the native population, because of their neglect of hygiene and sanitation, died at the rate of 83,000 per year. (133)

But such achievements are not to be attributed to the medical corps alone but also to the development of interest in, and general observance of, hygienic principles by the whole population, such as has been promulgated through our schools, school nurses, physicians, medical inspection, etc. Germany has led in this, with the result that her army consists of a finely equipped body of men—men physically fit.

Herbert Jones states that it is now possible with modern surgery and medicine to return to active service thousands who in former wars would have perished or been useless for the promotion of war. We may remark parenthetically that one optimistic German writer reports 88.5 per cent of German wounded returned to active service. He asserts that in the Crimean War 28 per cent of the wounded died; in the Italian War of 1859, 17 per cent; in the Prussian War with Denmark, 15.5 per cent; in the War of 1870–1871, 11.1 per cent; in the Russo-Japanese War, Japanese 6.8 per cent, and Russians 3.2 per cent. General returns, however, seem to indicate a higher fatality among wounded. Jones attributes the success of modern surgery and medicine not alone to their advanced stage but also to the general conditions of living. He points out that twenty years ago in England 40 per cent of recruits were rejected; that ten years later this was reduced to 30 per cent, and that now it is just a little over 20 per cent—and that, too, under most stringent requirements. This means that if the percentage of rejections were now what it was twenty years ago, there would be one half million fewer unmarried

men in England and Wales alone available for service. Thus the Public Health Service has added over 500,000 to the potential army. (109)

Field Involved. The business of the soldier is to fight and to march. To do these efficiently, he must be sound, must have good health. The source of the soldier is the general population. Hence it is quite essential that this source be vigorous and in good condition. For this reason military hygiene must not only include those factors which concern the health of the soldier as such in times of peace and war, but it must also consider those factors which enter in to make him what he is at the time of his enlistment (38). In short, it must treat of all those factors which determine the health of man.

If we can acquire and use the same habits of sanitation, hygiene, and cleanliness in peace that soldiers are forced to use in war, war will have done good, at least, in this respect. As it is now, the victory will lie with the War God, rather than as formerly with disease and pestilence.

II. DESTRUCTIVENESS OF WAR THROUGH DISEASES AND WOUNDS

We have already indicated, to some extent, the loss from these sources. We have shown that it is from disease, during war and following in its wake, that both the army and civilians suffer most. Not those slain in battle are the great loss, but those who remain maimed, unable to support themselves—those who are diseased and others whose afflictions are such that they carry infection broadcast.

Types of Diseases

As Woods Hutchinson (102) suggests, a catalog of diseases with which man is afflicted is practically a list of those suffered by soldiers. There are few, if any, peculiar to warfare. The presence of the various diseases varies with the times and circumstances. In such a war as the present one, because of the number of nations, races, their divergent sources, etc., the variety of afflictions is probably larger than in any previous war and the possibilities of new developments in the progress of these diseases, their treatment with the various races, etc., is great. Just as the Spanish-American War emphasized the destructive effects of typhoid, the Crimean War, those of cholera, so the present war is calling attention most conspicuously to typhoid, typhus, tetanus, and cholera. Mental troubles likewise, partly because of their prevalence and partly because physicians are now more able to diagnose them, are presenting data and serious problems.

Writers on military hygiene are seeking to impress upon the soldier, as physicians are upon civilians, the fact that most diseases are preventable and that prevention is much better and surer than treatment and cure. (1, 11, 69, 98, 44, 303, 162, 264, 36, 301, 93, 94, 381, 237, 280).

Deficiency Diseases. Among the types of diseases classed as deficiency diseases may be mentioned scurvy, disease due

to dental caries and beri-beri. Such diseases seem to arise from the absence of some element in the food taken. Lelean also classifies neurasthenia under this type. (133, ch. I.)

He states that food must contain vitamines if they are to serve their purpose. Vitamines are nitrogenous, metabolic bodies which are unstable because they contain more or less dissociated ions. Heat associates these ions but in so doing destroys their character as vitamines. Cabbage juice, for example, loses its vitamines at 60 deg. Fahr. "Every deficiency disease is apparently in aetiological relation with some specific vitamine."

Beri-beri. The old theory that beri-beri is a place disease, *i. e.*, confined to particular locations especially in the East, the Malay Archipelago, etc., has been proven untenable. It is not a microbe disease but is a result of deficient food. It is found among rice-eating nations and occurs only in connection with the use of finely milled grain of this sort. In the product of this milling, certain of the outer layers are omitted from the flour. It has been proven that these outer layers contain the vitamines which give the full food value to the rice. Hence by taking the whole grain this disease can be eradicated. (288)

Scurvy. Eighty-three per cent of the garrison of Port Arthur in the Russo-Japanese War are said to have suffered from scurvy. It has been known for some time that this malady occurs only in connection with mal-nutrition. The addition of one-half ounce daily of lime juice to the food has proven helpful.

Infectious Diseases. The soldiers are subject to, and especially exposed to, every type of infectious disease. Among those connected with the intestinal tract may be mentioned typhoid, typhus, ambulatory enteric (typhoid), premonitory diarrhoea, dysentery, and cholera.

Diseases of Present War. Illustrative of the extent and variety of diseases present among soldiers in war, we offer a list of those which have been already reported.

Anklostomiasis, in Egypt; beri-beri, cholera, and plague, diarrhœa, dysentery, kala azar, typhus, typhoid, polyneu-

ritis, tetanus, various mental diseases, *i. e.*, nostalgia, shock, etc., various sexual diseases, 'gun deafness', 'air sickness', etc. (140, 144, 302, 150, 320, 167, 168, 169)

General. We may expect every second man to spend some time in the hospital. Probably most cases will be due to sore feet or digestive troubles. Diseases due to exposure as polyarthritis, pneumonia, bronchitis, etc., will be—in fact, have been—frequent. Already in the Russian army cholera has been at work. Owing to recent progress in hygiene, that country as a whole has been able to keep the average loss from typhoid, typhus, smallpox, and dysentery about normal. In 1913, cholera seemed to have abated there. In 1914, 145 cases of cholera and 45 of bubonic plague have been reported. In India the plague rate is about the same, amounting to about 1,500 cases per week. It is from troops from that country that danger is to be expected. Herpes is rare and para-typhoid is seldom transmitted by contact.

Weichselbaum correctly writes that the chief war epidemics are typhus, typhoid, flux, and cholera, and that they have, already appeared. He suggests that they enter the digestive tract by way of the mouth, owing to improper handling of the food, etc. Germs perish easily through (1) desiccation; (2) acids; (3) decay; (4) high temperature, and he might have added direct sunlight. Hence they are usually harmless on dry bread, on acid or dry fruit, on cooked or heated food. As methods of prevention, then, the soldier should wash his hands often, thoroughly disinfect when necessary, and wash the food.

Mayer gives the following facts: From Sengal, we may get tuberculosis, lepra, bubonic plague, trypanosomiasis, beri-beri, craw-craw, guinea worm, filariasis, bilharaziasis, anklostomiasis, sand-fleas, yellow fever; from Algeria, trachoma and Malta fever; from India, kala azar; from East Siberia and Caucasus, relapsing fever. That leprosy will be smuggled into Germany, he thinks unlikely. Bubonic plague could easily enter through rats. He does not anticipate pneumonia in Germany unless it comes through Russia. Among the

Belgians, cases of sleeping sickness have already been found. He says it is spread through flies. It is possible to fight anklostomiasis by controlling stools through use of thymol. (150)

The lesson relative to the significance and importance of a well-organized and equipped medical corps learned by the army authorities from the Spanish-American War has functioned, as is shown in the report of the surgeon-general for 1913. The report shows conditions in the United States Army admirable as a whole. There had been a decrease of 18 per cent in the admission of sick and the rate was the lowest it has been for years. The rate of 23.97 out of a thousand incapacitated for the year was the lowest on record. The death rate was a little higher than usual, but this was due to a railroad accident killing 17. There were but 3 cases of typhoid for the year.

In 1909, there were 173 cases with 18 deaths; 1910, 142 cases, 10 deaths; 1911, 44 cases, 6 deaths; 1912, 18 cases, 3 deaths.

Prophylaxis was begun voluntarily this year. Sanitary measures and inoculation with anti-typhoid toxin had been kept up. Tuberculosis was low and venereal diseases were decreased, owing partly to a campaign of education and partly to the fact that by act of Congress the pay of those afflicted with such diseases is stopped during period of sickness. Alcoholism was the lowest in years. Malarial fever was the lowest since 1898 when the troops were first stationed in the tropics. The report shows, however, that this branch of the service needs more attention. (404)

Typhoid and Principles of Inoculation. One of the clearest expositions for the layman of the principles underlying the practice of immunizing is the second chapter of Major Lelean's book on 'Sanitation in War'. We can do no better than sketch some of his points. Immunity may be of three types—acquired, natural, and artificially acquired. An example of the first is afforded by those persons who having had a disease, such as scarlet fever, are immune to further attacks. Natural immunity consists in innate qualities or a quality by virtue

of which the individual is not subject to some particular infectious disease. We have artificially acquired immunity where vaccine, etc., introduced into an individual's system prevents disease.

Immunization is based upon the following considerations: (1) number of invading organisms (bacteria); (2) route of invasions; cholera is virulent in the intestines but innocuous in the blood, tetanus is virulent in wounds but innocuous in intestines; (3) virulence of organisms, *e. g.*, no case of recovery from developed hydrophobia has been reported; and (4) physiological resistance. One should consult the author's diagrams illustrative of his theme, for they tend to make an obscure subject plain. As his work is designed for the benefit of soldiers, his way of putting his data is simple and convincing. The struggle of the anti-bodies, etc., with disease is compared to a battle as follows:

The organisms (bacteria) are the enemy invaders. The body is the invaded country. The toxins are the enemy's projectiles. The complement is the unarmed population. The tissue cells are the arsenals, the anti-toxins are the defenders' projectiles: the amboceptors, the bayonets of the defenders; and the phagocytes, the body snatchers. Here is the

Campaign

1st. The Invasion

The unarmed defenders are driven back by the gun-fire of the invaders (negative chemiotaxis and toxins). The arsenals of defenders are put out of service (toxins kill tissue cells). Invaders may capture the lines of communication (the blood vessels) and reach the capital (heart). In this case, surrender must follow (death of defender).

2nd. Rally

But the invaders' fire is checked by defenders (anti-toxin). Defenders armed with bayonets (amboceptors) converge on the invaders (positive chemiotaxis).

3rd. Battle Joined

The invaders' fire is smothered (toxins neutralized). Defenders bring bayonets into play (complement and amboceptors).

4th. Victory

Invaders penned and annihilated (abcess cavity). Dead of both sides removed from the body (organisms and complement). This is done by the body snatchers (phagocytes). Invasion defeated.

5th. Permanent Mobilization for Protection

Defenders are now armed with bayonets never becoming obsolete (permanent amboceptors). Even when the ammunition becomes obsolete for use of present guns (transient anti-toxins), enough bayonets remain to enable defenders to crush any subsequent invasion before the enemy can develop gun-fire (permanent immunity by bacteriolysis) before toxins can do harm. (133, ch. II.)

The process of typhoid inoculation causes very little inconvenience. For example, with a large number vaccinated it was found that but 1 per 1,000 was incapacitated for 5 days; 3 per 1,000 were incapacitated for 3 days; 996 per 1,000 were incapacitated for less than 3 days. Out of 27,000 cases of inoculation among the Canadian troops, there was but one hospital case (99 per cent of the cases are usually able to work forty-eight hours after the inoculation). (396, 201, 4, 323, 321, 322, 75, 132)

It should be emphasized that though typhoid is water-borne, to some extent, probably the most frequent method of conveyance is direct carrying from excreta, urine, etc., by persons, flies, etc. The typhus bacilli are said to persist in feces for three days, in water *drum* 3 days to three weeks, in textiles for three months, and in butter for four months. After the patient has recovered, he may remain a carrier for as much as four years and perhaps for life. The remaining bacteria may live in masses in necrotic patches of the mucosa of the gall bladder, in such a position that the anti-bodies can not reach them. The bile-salts neutralize some of the anti-bodies. A subsequent diarrhœa may then sweep vast quantities of them free and thus infection is made possible. Germany is said to have .03 per cent infection from contact carriers, the United States, 3 per cent. One example of infection is afforded in the 110 cases caused from eating pies made by one infected cook. Six deaths resulted. This means careful inspection of army cooks. (193; 434—bulletins No. 3, 4, 5, 6)

Lelean points out the necessity of having ample laboratory facilities present with each army in the field. In fact, traveling motor laboratories now accompany the troops at the front. Furthermore, careful statistics should be kept of sources of

infection, progress of diseases, treatment, etc. It is well to serve a disinfectant at night to those suspected of having typhoid. Apparatus for use of the same should be carried with the troops. Suspects should bivouac around the medical center, and equipment of troops in the field should be disinfected with apparatus now used for such purposes. The stock concentrated disinfectant used by some of the European armies is Liquor Cresoli Saponatus with a carbolic coefficient of 12. Carbolic acid and formalin supplied at the rate of 8 ounces to the gallon are good. The following data are important. (133, Lecture IV.)

Name of Disease	Usual Number of Days of: Incubation	Segregation
Cholera	3–6	12
Chicken-pox	10–16	20
Diphtheria	2–10	12
Enteric fever	10–14	23
Erysipelas	3–10	12
Influenza	3–4	5
Measles	10–14	16
Mumps	10–20	24
Plague	2–8	21
Scarlet fever	1–4	10
Smallpox	12–24	16
Typhus	5–14	14

While we have mentioned only typhoid inoculation specifically, attention should be called to the fact that serums, tuberculins, etc., are given for other infectious diseases as smallpox, diphtheria, scarlet fever, typhus, malarial fever, yellow fever, cholera, meningitis, etc.

The main sources of infection are the sick man, air, water, food, and insects. Therefore isolate the sick. See that the air, water, and food are clean, pure, and wholesome. Destroy the insects.

Poison Gas. One of the newest methods of waging warfare is the employment of poisonous gases, contained in bombs exploded in the camp of the enemy or in fumes wafted by winds into their trenches. Actual data of what is being used

and how are not available at this writing. Chlorine, sulphur dioxide, and nitrogen tetroxide are possible agents. As to the probability whether it is bromine or chlorine, the latter is the more likely because of its heaviness and cheapness. It is two and a half times the weight of air and hence settles quickly into trenches when used. Various devices are used for protection from such asphyxiation. A damp cloth placed in the mouth, especially if a little bicarbonate of soda has been put in the water, accompanied by breathing in through the mouth and out through the nose will afford some protection. (397)

Air Sickness, etc. Popular writers are referring to some maladies attendant upon the employment of air ships as air sickness. Whether there is any real basis for this designation remains for the future and further investigation to demonstrate. It is said to be indicated by a sort of "sickly nausea accompanied by severe headache and a violent desire to sleep. Swift descent through air will bring on these symptoms, which medical men say are caused by blood circulation of the aviator being unable to at once adapt itself to rapid change of atmospheric pressure caused by sudden drops in the air." Possibly we may have new health problems to solve in connection with the submarine. (281)

Gun Deafness. Gun deafness is not peculiar to the present war though it is probable that it will be far more prevalent than formerly. Horne attributes it to the effect which very loud noises, sudden and unexpected, have upon the terminal portions of the nerve-structures of the ear. The nature of these injuries is such as to render recovery doubtful. The drum of the ear may even be ruptured (93, 309). Suzuki reports, "during firing (by ships) membranes were often ruptured and there were concussions of the labyrinth. The list of wounded included 116, *i. e.*, 7 per cent, with concussion of labyrinth or rupture and congestion of tympani membrane." The sudden condensation and rarefaction of air in the external meatus is the cause, writes Horne. One ear usually is more affected than the other. This is also often found to be true

among sportsmen—in this case the left ear in a right-handed shooter being the one affected. However, this malady is to a large degree preventable by keeping ears as far as possible from the muzzle of the gun. It is a good idea to hold the mouth open (chew toothpicks, etc., during firing). The eustachian tube should be kept open. Suzuki suggests that sterilized cotton wool be placed in the ears. The English admiralty found this useless. Various aural plugs have been invented and tried. With what degree of success, we are not at this time able to report. The characteristics which it will be necessary for such a piece of apparatus to have are:

(1) It must be close-fitting and impervious, (2) must reduce intensity of sound, (3) must not affect the hearing, (4) must be easy to insert and remove, (5) must be non-irritating, (6) must be inexpensive, (7) must be antiseptic.

The effect of gun-fire on the ear is not directly proportional to one's distance from the gun. Ross states, "There is a probability that if a man stands at so short a distance as D from the muzzle of a gun which discharges a projectile of a weight W, his sense of hearing will not be hurt." To illustrate, if D is proportional to the sixth root of W, and D is 10 feet for the discharge of a 64-pound shot, what is D for the discharge of a 9-pound shot? D equals Wxk, k being a constant in this case, 5: then D equals 7 feet compared with the *16* for 64 pounds. (314, 309)

Cholera and Plague. We shall not trace the history of the terrible toll cholera and plague have demanded in peace and war times. War has ever served to spread them. Western troops, invading the orient, have become infected and have scattered these diseases in their travels often carrying them to their home lands. Oriental troops in their invasions and migrations westward have produced like results. In the present war the danger is from the near east. Some cases are rumored in Russia. A number of cases have been found in Serbia. There may be some in Greece and probably Turkey has many, though facts relative to her condition are absent. The plague at the time of report (1914) was present in Beirut and Leb-

anon, Jaffa and Caiffa, Tripoli (Syria), Smyrna, Adalia, Jeddoh, Basra on the Tigris and in the Russian Steppes. (221, 265, 152, 396; 434, Bulletin No. 5; 391, 291, 29, 80, 202)

The disease is easily spread in the camp through dirty hands and improper use of urinals and latrines. It is carried on the boots, etc. This shows that conservancy must be as nearly perfect as possible. It was with great difficulty that the Bulgarian troops were made to use the latrines. We have already pointed out how severely they suffered from cholera in their war. Simpson shows that moving crowds, water, cattle, flies, floods, and persons are modes of infection. Persons may be carriers without themselves having the disease. It is then seen that great care should be used in examining, cleansing articles shipped, etc. The water supply should be pure. The sick should be isolated. Inoculation may be tried. (292, 293, 290)

Strickland has given important data with reference to the incidence of plague in Europe and the part played in it by the rat. He states that both the black and the brown rat are carriers of the flea which is responsible for cholera but that their different habits make the black rat the more serious menace. He cites Amsterdam as being infested with black rats and having numerous cases of the plague. In England, the brown rat conquered and drove out the black, and the incidence of the disease became almost nil. The black rat is semi-domesticated, does not fear man, and hence has constant access to him. The brown rat is savage and shuns man, being afraid of him. It lives in the foundation of the house, if in it at all. It tends to migrate to the country in the summer and thus lives in town but half the year. Its first preference is the farm-yard; its second, the village; and its third, the country town. It is not easy to find in a large city. (227)

The author attributes the cessation of the plague in London to better housing conditions, whereby the rats were eradicated to a large extent. Some of his conclusions are:

1. The black rat is responsible for the great European plagues.
2. Good housing has forced the disappearance of the black rat.

3. Upon this the brown rats increased.

4. The brown rat is not an important factor because of its shyness and because of its habits. It is dangerous only in the winter.

5. For protection against the black rat, buildings should be constructed of stone, etc., instead of wood.

6. For protection against brown rats, limit their food supply or rather, deprive them of any.

Dysentery and Diarrhœa. Dysentery and diarrhœa are ever present in troops marching, fighting, and encamped. During the Franco-Prussian War, for example, there are said to have been in one army some 40,000 cases with 2,000 deaths resulting. Sandwich claims that it is water-borne. Among the returned troops at Aldershot in 1901, there were 170 cases and 28 deaths. (299) The probability is that such returning troops spread the infection throughout the vicinity to which they return. Extreme care in sanitation serves to protect them. Flies are instrumental in the infection. Refuse should be taken care of and food properly protected and stored. As a means of prophylaxis, Grober urges the soldier and likewise the civilian to refrain from touching the face with the hands (as soldiers are likely to do in smoking), to avoid errors in diet, and to exercise cleanliness in eating. He further suggests that five drops of hydrochloric acid in some beverage at each meal is good. (298, 74, 209, 205)

Tetanus. This disease, ever present in war, is demanding an unusual toll in the present struggle. Many complications accompany it and the literature, technical and otherwise, is voluminous. Kreuter has found it frequently resulting from shrapnel wounds, from men being run over, or from their being kicked by a horse. In his cases the cramps were restricted to the region of the injured parts. The disturbances in swallowing manifested themselves early. The average mortality of cases where the period of incubation was less than from 8 to 10 days was from 80 to 90 per cent. It was found that if anti-toxin was administered within less than 10 days of incubation the mortality was lessened from 95 to 73 per cent, where given in cases of longer incubation, from 40 to 70 per cent. (318, 319, 71, 127)

Mental Troubles. Oppenheim claims that neurological ailments furnish a large contingent of the morbidity due to war. The hardships, etc., frequently give rise to psychoses and neuroses. However, he finds that such ailments occur for the most part in those already predisposed. A fact of interest to psychologists, especially to those of the Freudian school, is that dreams of the soldiers partake largely of war content. In cases of mild epilepsy, the number of attacks may be increased by war. (434, Bulletin No. 5; 144, 192, 160, 308, 162, 309, 24, 217, 180, 183, 312, 307, 311)

Mendel finds that the alcoholic cases (chronic) are the least amendable to discipline and that the nature of their offenses is a lack of respect for their superior officers. (154)

One writer states that preceding the outbreak of a war there is an increase in the number of nervous troubles which continue throughout the war's duration and manifest themselves for some years after its close. For this reason it is necessary to exercise great care in the selection of men, especially sailors. It has been pointed out by others that in the present conflict, though the nervous troubles, derangement of the mind, etc., are frequent, the recoveries so far have been rapid. It should be remembered that in the midst of such times, data are hard to obtain, and as yet no conclusions can be announced relative to these points. (315, 305)

So far no scientific studies have been made of the effect of war on the minds of officers and men. Some authors have pointed out particular battles in which it seemed to them the losing general was himself the cause of his defeat, owing to the early stages of paresis having set in. Many desertions are probably due to dementia praecox. The facts show that mental disease is an important problem. One-fifth of the discharges is said to be due to them. In 1912, out of 1,062 discharged from the United States Army, 200 were incapacitated by mental diseases. This does not include the neurasthenic and hysterical cases. Dementia praecox gives about 56 per cent of the cases. (306, 316, 313, 40)

After calling attention to the frequency of hysteria, traumatic and otherwise, which is increasing in this war, another writer points out the important rôle played by auto-suggestion. He cites specific cases: (1) one man had his back hurt through the fall of a wooden sleeper and palsy of left leg resulted, the indication being that the trouble was purely psychical; (2) another who was leaning his shoulder on a parapet near which an explosion occurred, developed hysterical symptoms, although there were no discoverable lesions responsible for them; (3) another case was that of a lieutenant troubled with dysentery who became paraplegic; (4) an officer who had carried a wounded man from the danger zone, became weak in his right arm and foot three days after and had hysterical symptoms. The patient had seemed healthy prior to the accident. But many factors are at work besides the mere accident, such, for example, as fatigue, hunger, sense of responsibility, strained attention of particular organs, concussion of explosions, etc. He finds traumatic hysteria more frequent than traumatic neurasthenia. He also states that the emotions seem to play a part in the development of hysteria. (310, 307)

Some of Weyandt's suggestions and data are as follows: Get the patient away from the scene of his trouble as soon as possible. Quiet him, using narcotics, even the strait-jacket, if necessary. Quietness is essential. He finds no particular war psychoses. But those predisposed are quite liable to be thrown by the stress of conflict into well-marked cases. Epileptics, those with slight imbecility, those with manic-depressive or catatonic attacks, those with syphilitic brain or spinal cord troubles, are very suspectible. He, also, urges that we avoid 'mass psychosis' by the immediate removal of a patient from the scene. It was found that in the Franco-Prussian War the psychoses of the Germans were 0.54 per thousand; of the United States troops in the Spanish-American War, 2.7 per thousand; of the British in Boer War, 2.6; of the Russians in the Russo-Japanese War, 2.0; of the Bulgarians, 0.33; Montenegrins, 0.25; Servians, 0.25; and Greeks, 0.097 in the late war; while among the Germans in their South African expedi-

tion it was 4.95, and including epilepsy and hysteria, 8.28 per thousand. Heat stroke and concussion of the brain require complete rest and quiet at once. (248, 154, 31, 311)

Venereal Diseases. Keefer claims that these diseases still constitute the big problem of the army causing more trouble than any others. He states that it is claimed the United States army suffers more from these than any foreign army. Facts are not numerous and exaggeration is apt to occur. Up to the eighteenth century almost an army of prostitutes accompanied the warriors and indeed in some cases their number exceeded that of the soldiers. With the dawn of compulsory military systems this was altered, but hordes followed Napoleon's troops according to Blaschko (23). He points out that the men left in charge of a conquered city are especially exposed as brothels are still maintained in some. He finds the number of recently acquired cases and reservists sent back for treatment larger than is generally supposed. In the last half of the Franco-Prussian War, 9 per cent of morbidity was due to these diseases. He says "Absolute prohibition of public dances, and the early or total closing of saloons will help . . . Weed out any loose women that may attach themselves to the army in the guise of nurses, etc. Do this especially at the bases." He would have intercourse with prostitutes prohibited, even made a crime, and urges that "keeping secret a beginning venereal disease justifies punishment." It is for the government to take care of the class of women thus deprived of their means of livelihood.

An English medical writer states that the gonorrhoea found among the present English troops is acquired in most cases in their new environment after enlistment. One of the agents instrumental in the spread of this disease, he says, is gratuitous alcohol, *i. e.*, the habit of treating. In all cases, early treatment at a home camp is desirable. It will take six weeks of treatment before the recruit can be considered safe and sound. There should be instruction on these subjects by the medical corps. Temperance has had an excellent effect. Out of some 36,000 troops examined but one case of gonorrhoea

was found. In fact, such numbers as are available seem to lead to the conclusion that the extent of these diseases has been overestimated. (300, 30, 163)

Bruck found venereal diseases transmitted through free prostitution. The officers in his region were detailed to stop this. The lewd women were found in saloons, cheap restaurants, and resorts of kindred character. The officer worked in conjunction with a French policeman under the direction of a staff officer. The men were finally led to point out certain diseased women who were then detained and interned for treatment. This frightened them as a class and infections became reduced to the normal number. Of numerous women examined, only a portion had *clinical* gonorrhoea. However, the microscope revealed much more infection. The results show that the bacilli may exist as saprophytes in the external genital organs of the female. (30)

Keefer offers the following suggestions by way of prevention: (116)

1. Isolate the infected.
2. Make it a crime for a diseased male to spread the disease.

A plan of the United States army involves the following:

1. Enlisted men are to be physically inspected twice a month for detection of venereal diseases.
2. The exposed soldier must report for cleansing and preventive treatment immediately upon return to camp or garrison.
3. Any soldier who fails to report when he is suffering from these diseases is to be court martialed for neglect of duty.
4. Afflicted must stay in post while affected.
5. Officers shall attempt to give suitable games, exercises, etc., to occupy time of men properly.
6. Officers shall point out the tremendous importance of this disease.
7. By act of Congress, those absent from duty owing to venereal diseases or alcohol do not receive pay during such time.

As indicated in our introduction, the work done in Vera Cruz indicates that instruction in prophylaxis helped and hence should be given. (331, 434, Bulletin No. 3; 50)

Feet. Not only are soldiers incapacitated for their duty by disease and wounds, but many are rendered a burden to

society through crippling of the feet. From what has already been said, the importance of strong, sound feet is probably apparent. How significant is the rôle played by them, not only in marching and running but in every-day work, has not been observed by the general public as much as it should be. Physicians have for years been pointing out that the improper shoe is responsible for nervous troubles, and disorders of the visceral organs, as well as foot pain. The army authorities therefore do well to insist on the proper fitting of the proper kind of shoe. But careful attention should also be given to the socks of those who are to march or use the feet much. Keefer claims that light woolen socks are best for marching. Many of the English troops aim to have shoes of such size that two pairs of socks can be worn with ease. Thereby the friction is reduced and warmth is increased. German soldiers wrap triangular oil-soaked cloths about their feet in lieu of socks. A British expert states that the life of the sock furnished their soldiers is about 60 to 70 miles marching. Socks should be changed and washed daily if possible. Dirt promotes friction and if washing is impossible, they should be dried and thoroughly rubbed. (116, 133)

Keefer gives the following directions for fitting shoes. The individual should stand on a scale board, flat footed, with a weight of 40 pounds on his person. The length of foot is read from the board. Measure the distance around the ball of the foot at the base of the toes and add 2 to the scale length. A table is furnished for widths. For example, a foot measuring 6½ width and 9½ size, requires an 8½ D shoe. Always lace the shoe to the top in trying on. There should be at least ⅔ of an inch beyond the big toe. (116)

Lelean states that foot troubles arise from insufficient space (vertical) for the toes and from lack of sufficient curvature at the heel (back). (133, ch. I)

Frost-Bite Trench Feet. So-called frost-bite has caused a great deal of trouble in the present as in former years, though not so well recognized then. In January (1915) two brigades of English infantry were out of action because of it. The term

is a wrong one, for low temperature is not the cause. The trouble arises from prolonged contact with moisture or cold water—such as men in the trenches and those operating in lowlands and marshes have been subjected to.

It is often combined with superficial areas of gangrene started by interference with the circulation. In the Crimean War, there were among the allies some 1,924 cases of such 'frost-bite' with 456 deaths in the year 1854–1855, while in 1855–56 there were but 474 cases with 6 deaths. The temperature for the two years was about the same, but in the former year the trenches were flooded, the clothes were dripping, the tents leaked, and wet blankets were used. This was remedied in the year following, with the results given. (133, 187, 47, 332, 333, 334, 335)

Lelean points out that approximately 25 per cent of troops suffer during the first ten days of a campaign from foot troubles. During the early part of the Franco-Prussian War some 30,000 men were incapacitated in the German army through foot troubles. Improperly clad and sore feet may increase by 20 per cent the amount of work necessary to be done, and by thus raising the temperature, absorb two-thirds of the margin between optimum and pathological heat. (133, Ch. III, 332)

He finds that many ailments are due not to shoes, but to defects in socks such as holes, ridges, and poor darning. These may cause such pressure that the circulation is impeded, thus affording opportunity for the development of gangrene. Of the two pairs of socks advised to be worn, he suggests that the inner be woolen and the outer—that next the shoe—cotton. Even thin greased or oiled-paper may be substituted for socks. Upon arriving at camp, the soldier should clean, dry, and 'dubbin' (rub with some form of tallow or grease) his shoes to keep them water-proof and pliable. If the feet are soft, it is well to wash them in cold water and rub them well with alum or spirit lotion. If washing with water is impossible, rub thoroughly with coarse cloths or with the hands. Put on clean socks and shoes for camp. It is a good plan to soap the insides of socks

if much troubled. Talc powder is good. In case of blisters, puncture with sterile needle and paint with iodine. Corns should be taken care of by the regimental chiropodist. For bromidrosis (fetid perspiration) soak the feet on alternate days in a 2 per cent solution of formalin or apply 2 per cent salicylic acid ointment.

Miller, from his observation of 376 cases of 'frost-bite', discovered that there was freezing at the time in 65 cases out of 100, that all were wearing short boots with more than one pair of socks, and most of them wearing puttees; that there was a change in the color of the feet to red-blue and black noticed by the patients in 58 per cent of the cases, paleness in 42; numbness, 23; pain, 9; and swelling, 10. They had been standing in mud or water and mud. (156)

Mayo-Robson points out that gangrene often follows, owing to the arterial blood supply being shut off. Tissues die as a result. In case of afflictions of this nature 'frost-bite' or 'trench feet'—he advises as follows: friction with snow or cold water in a cold room whose temperature is gradually increased; friction with oil of turpentine, or spirits with soap and liniment (useful in the early stages). Raise the limb after treatment, let it have no constriction, swathe it in cotton-wool, keep dry and sterile. (196)

Owing to the relatively small number who develop gangrene (according to his data) he thinks it possible practically to prevent it in this connection. He urges the soldiers not to impede circulation by tight foot-wear, and to avoid inadequate covering. As the cause is standing in melting snow, the boots should be water-proofed.

One of the English army orders suggests the following: Frost-bite is liable to occur (1) when boots and puttees are too tight; (2) when the general circulation throughout the body is less than normal; and (3) when socks, boots, and puttees are wet. The best precautions are (1) boots should not fit too tightly, but should be at least a size too large. When boots are worn, it is well to wear two pairs of socks, although this is dangerous if the boots are small as it leads to pressure on the

foot. Puttees should never be applied tightly. (2) The general circulation can best be kept up by keeping the body dry and warm; a mackintosh sheet worn over the great coat is of assistance where no water-proof is available. Officers should see that dry standing is provided in the trenches whenever possible by means of drainage, raising the foot-level by fascines of brush wood or straw with boards on top, or by the use of pumps where these are available. (196, 334)

Temoin finds many cases of foot trouble in the French army, and also that the toes are attacked—gangrene setting in and the toes 'dropping off'. He states that local nutrition (regulated of course to a large extent by the circulation) is a leading cause. He suggests that soldiers can help avoid the trouble by removing the shoes once or twice a day or more, if possible. (231)

Though repeating somewhat matter previously given, we present the following suggestions of another medical officer. Boots should fit with comfort, not too tight nor too loose—friction should be avoided; soften the leather with 'dubbin' or oil; remove the nails or seams inside shoe; the socks should fit properly (dirty, badly darned, holed, or very thin socks are not good); lace the boot properly. Wash and dry the feet thoroughly each day; it is a good plan to soak the feet in a bucket of water (cold) to which has been added a little permanganate of potash, alum powder, salt or salt petre. Let out the serum of blisters with a clean needle—sterilized by passing through a match flame—do *not* remove the superficial layer of skin; treat sores with boracic lint or powder, a small piece of lint being wrapped over the sore and renewed daily; corns and hard skin may be removed by applying a few drops of salicle collodion for three nights and then after bathing in hot water, peeling off the hard portion. (108, 333)

For sore feet a Red Cross leaflet advises the following:

1. Wash the feet with soap and water. Dry gently but do not rub.
2. Dab with methylated spirit on cotton-wool except where skin is broken.
3. When dry dust with powder composed of equal parts of starch and boracic powder or fuller's earth.

4. Bandage with clean bandages, preferably of demette, not too tight; or else put on clean socks.

5. Reddened skin or recent blisters should be protected by strips of strapping.

6. All corns should be protected by strippings. Open sores require surgical advice and this should be sought whenever possible, especially if the surrounding redness of the foot is extending.

7. Toe nails should be cut short.

8. Hard boots should be well greased—mutton fat is best. They should be well dusted inside with starch and boracic powder. (335)

These complaints tend to disappear with the approach of spring. (332)

Protection from Cold. As an indication of methods successfully employed by the Japanese in Manchuria during the Russo-Japanese War, the following extract is taken from a German translation of a Japanese work describing their methods.

Every man had an extra pair of boots, mittens and foot cloths to change at night. They were made to eat often to keep awake those inclined to drop asleep on the march or in changing guards. They were kept from doing exercise that would make them sweat and they were not allowed to lie down in the snow. When straw was unavailable, they had to shovel the snow away so as to lie on the ground. The clothes and shoes were made larger for winter than summer wear to allow for layers of air. The button holes and other openings were protected with special care after small frozen areas corresponding to the button holes had been found on the chests of some of the soldiers. The fingers and feet were rubbed with tallow or other unsalted fat and mittens were worn over gloves. The mittens were sometimes packed with straw or feathers and the shoes with horse bedding. Fur keeps out the wind better than woolen and a fur abdominal bandage proved a great help in extremely cold weather. Flannel suspensories were found indispensable at the latrines. Muffs of fur or felt and wristlets of fur or wool were highly recommended. Whenever the hands were frozen, it was learned that the men had been wearing knitted gloves. The foot cloth worn instead of socks can be dried in emergency by wearing it next the body. Wrapping the toes in paper, or the whole foot in a pig bladder, was also found useful at times. Battalions were provided with flint and steel for starting fire when matches were lacking or too damp. (279)

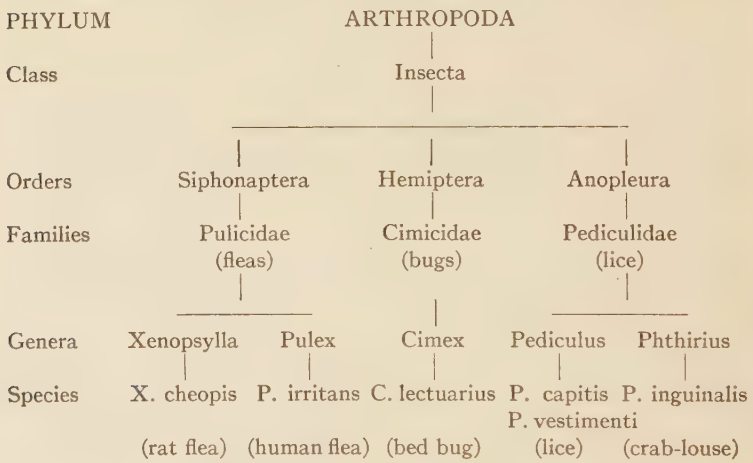
Vermin

This subject is of great importance, not only because of the inconvenience caused by insects but also because of the disease-developing and disease-carrying power of many. Ship-

ley has rightly designated them 'the minor horrors of war'. They have already (1915) become a fierce pest among the troops in the western field and the problems of their control and eradication are large. (220, 440)

Of those giving trouble, Major Lelean presents the following outline: (133, pl. 34) Sanitation in War.

B. Apterous Ecto-Parasites (wingless insects, breathing thru stigmata which may be closed by oil thus stifling them).



Part Played by Some Insects. In a brief résumé, it is impossible to cover all the details of the part played by each insect. For this reason we shall call attention to the known and probable part played by the more conspicuous. Hewitt has given an excellent little treatise on the house-fly showing its habits, etc., and the significant part it plays in typhoid, and possibly in anthrax, gangrene, and tuberculosis (89). At the present time investigations are in progress which seem to indicate that the stable-fly may be a carrier of meningitis.

Lice not only prove a source of irritation, thus diminishing efficiency, but also have been connected with the transmission of typhus and relapsing fever. Their continued operation weakens their host, interferes with sleep and provokes a degree of psychic disgust which causes more fear than bullets. In

this connection Shipley's quotation of the soldier in the South African War seems apropos. "We strip and picks 'em off and places 'em in the sun and that kind o' breaks the little beggars' hearts." He suggests the following method of guarding against them: (220, ch. 1)

1. Search clothing as often as possible for traces of them.
2. Try not to sleep where unclean persons, especially affected ones, have been.
3. Change clothing as often as practicable. Lice will die in unused clothes, usually within a week. Change at night and isolate clothing. Keep infected clothing segregated.
4. Burn verminous clothing for which there is no further use.
5. Lice on the person may be destroyed by application of petrol, paraffin oil, turpentine, xylol, or benzine. Beware of fire or blaze after applying. Soap and wash the head within twenty-four hours after application if possible. Repeat two or more days if necessary. Use fine comb. Tobacco extract has been recommended by some. Scald underclothing about once every ten days. Turn the clothes inside out. Subject to heat or jet of steam, especially along the seams. A hot flatiron is good. Get rid of them somehow.
6. Avoid scratching.
7. Instruct privates along this line.

Bubonic and cholera are taken from fleas carried by rats.

Dutton thinks lice are also agents in transmission of enteric.

Diseases of the intestinal tract are often caused by moths contained in the army biscuits.

Reed has pointed out the part played by mosquitoes in yellow and malarial fevers. (193, 434, Bul. Nos. 4 and 6)

Itch mites, chiggers (red bugs), ticks, leeches, etc., through their habits in connection with their hosts, cause irritation and this in turn causes scratching. The surface thus exposed gives ample opportunity for infection.

The blood-sucking insects, such as the bed-bug, are agents in the spread of relapsing fever.

Protective Measures. Lelean has based his work upon war conditions. Hence his suggestions for protection against these organism are valuable.

In the case of the fly, use all the means that have been urged in times of peace. Where there are large bodies of troops and

especially cavalry, the excreta must be well taken care of—incinerated if possible. They should not be allowed to accumulate. Burial of excreta is not absolute protection. The pits, latrines, cess-pools, etc., should be treated with insecticides. Camphor plus phenol, 4 ounces to the 1,000 feet, is good. Protect food from flies.

A good anti-vermin product consists of kerosene and olive oil in equal parts. A solution of 10 per cent acetic acid combined with the use of a fine-tooth comb is good. Kerosene and all the volatile hydrocarbons applied neat, 4 per cent formalin solution, ammoniated mercury ointment, 5 per cent solution of mercury in ether, will prove useful against various vermin. The Germans shave the head.

For body-lice steam sterilization is good. Fill the seams of the clothes with grease, soap and crude oil, etc. An emulsion of ½ per cent lysol and 20 per cent soap to lather the body is excellent. Here are some dusting powders suggested: 2 per cent iodoform, 2 per cent creosote, 96 per cent napthalene; or ammoniated mercury 1 ounce, zinc ½ ounce, magnesium silicate ½ ounce. Powder black heelebore root with 30 per cent borax; powdered sulphur in the clothing. Give the garments a hot ironing. Treat the crab-louse with mercury ointment.

For human fleas use pyrethrum powder, sprinkle iodoform. Burn earthern floors. Use an emulsion of 5 per cent cresol; 20 per cent soft soap on other floors.

Treat bed-bugs with pyrethrum powder, sulphur dioxide, phenol and camphor, or hydrocyanic acid.

Copeman points out the necessity of having change of garments, especially of shirts and underclothes. The infested individual should bathe and also the inmates of his tent at the same time. Dry lather the bodies with cresol-soap solution especially the hairy parts and allow the lather to dry on the body. Wash the shirts in the solution of the same made in hot water. Turn the tunics and trousers inside out and rub with lather, especially the seams. Let this dry in the garments. One may also dust flowers of sulphur in the clothing. (41)

Wounds

General Statistics. Keefer gives the following estimate of casualties in battle. It is presumed that there will be a loss of 12 per cent; that of 100 men hit, there will be one dead to each four wounded; that:

20 will be killed
15 require transportation lying down
35 require transportation sitting up
5 will be too wounded for transportation
25 will be able to walk

The head and neck will be wounded in 16 per cent of cases
Trunk will be wounded in 30 per cent of cases
Upper extremities will be wounded in 26 per cent of cases
Lower extremities will be wounded in 28 per cent of cases

He states that 84 per cent of wounds will be caused by rifle, 14 per cent shells (shrapnel), 1 per cent by bayonets, 1 per cent by lance and saber. This was in 1914. But the developments of the war have forced a revision of these figures, for in the Bulgarian and the present war, the shrapnel and shell wounds form by far the larger percentage of injuries.

Trial and Error Method. We can not go into a detailed discussion of the treatment of wounds in war, for the subject is too technical and too large for our handling. The treatment of wounds now is a problem largely of surgery—not of medicine. And here the skill and science of peace times is put to service and taxed to the limit. Perhaps the large number of cases, the variety of the wounds, etc., allow of a certain amount of *empirical* investigation which would not be tolerated in peace times and from this we may profit. We have advanced so far that we are now able not only to rescue many who formerly would have perished, but are even able to return them to active service within remarkably short periods of time. A popular article quoted the following as coming from Berlin:

Eight hundred and eighty-eight of every 1,000 wounded soldiers brought into German military hospitals not in the war zone, in August 1914, were discharged fit for service and 30 of the remainder died. In April the number restored to duty had risen to 912 per 1,000 and the deaths had fallen to 14. With the single exception of March the death rate showed a steady decrease,

and the average for the nine months from August to April inclusive was but 1.9 per cent. The percentage of those discharged fit for duty shows an average of 88.5 per cent.

In the Crimean War, 28 per cent of the wounded died; in the Italian War of 1859, 17 per cent; of the Prussians, in the war with Denmark, 15.5 per cent; in 1870–71, 11.1 per cent; in the Russo-Japanese War, 6.8 per cent Japanese and 3.2 per cent Russians. (460)

Fatalities. The Lancet, as reported in *July* (1915), when discussing the Prime Minister's report on casualties to the House of Commons said:

Of the total losses in the army, the killed numbered 3,327 officers and 47,015 non-commissioned officers and men. In no previous war of which we have accurate statistical records has there been so great a loss of life in a similar period of time, and the figures dealing with the army can be submitted to certain rough comparisons.

Throughout the Crimean campaign the British losses were 2,755 killed and 12,094 wounded and our allies lost 8,250 killed and 38,868 wounded. In the Franco-German war of 1870-1871, during the whole period from July to April the Germans lost 17,750 killed and 96,189 wounded. In the Russo-Turkish war of 1877, the Russians lost 32,780 killed in action and 26,286 wounded. In the absence of authoritative statistics as to the number of men engaged, it is impossible to compare the relative losses by wounds and death in the present campaign with previous experiences.

The ratio of wounded and missing is as 1 to 4.25 or 23.5 per cent. In the Crimea, the ratio of killed to the number of wounded and missing was as 1 to 4.4 or 22.7 per cent; in the Franco-German war of 1870, 1 to 5.7 or 17.53 per cent; in the Russo-Turkish war, 1 to 2.17, or 45.98 per cent; in South Africa, 1 to 5 or 20 per cent.

Dum-Dum. Dr. Keen and many English army medical men have pointed out that the peculiar nature of the wounds inflicted by modern bullets has given rise to the general notion that various armies were using dum-dum bullets. There seems little real evidence to substantiate the claims made earlier in the war to this effect. Dr. Keen says of the modern bullet:

The shorter the range the greater the explosive effect, even in soft muscles. At long range, it may simply perforate the bone, especially near joints where the bone is spongy in texture. The trenches in Belgium are generally separated by short or sometimes very short distances. The violent explosive effect at short range has given rise to the charge by both sides in the present war that dum-dum bullets were being used.

This he thinks unlikely and points out further that the spreading of the jacket covering the bullet also tends to give the peculiar wounds. Many of the wounds are found smooth and clear cut where the missile has entered, but shattered and torn where it emerges. (319, 447, 456, 37, 143)

Wounds vs. Disease. Seaman points out that in the Russo-Japanese War the mortality was 81,000, of whom 60,000 died of battle casualties; 30 per cent died from diseases, and 70 per cent on the firing line. Thus modern war is at least tending to confine its fatalities more and more to the direct employment of its engines of destruction. (215, 77, 118)

Morale and Self-Aid. As Sager indicates, the fate of the wounded depends upon the nature of his wound, the place where he falls, and the time at which he falls. The exigencies of modern warfare make it impossible in most cases to succor the fallen at once. The great fatality rate among the medical corps serves not only to indicate this difficulty but to testify to the heroism of these men who thus go into danger to succor the needy. Promptness of first aid is one of the prime factors in recovery and favorable prognosis. The *morale* of the wounded soldiers has proved excellent and therefore has been a large factor in their rapid and complete recovery. The difficulties of transporting the wounded are great. The hospital trains, excellent as they are at the outset, are soon needed for the transportation of active soldiers to the front for action. He suggests that in the western region, the humus and the large amount of excreta from the horses of the cavalry contribute to the spread of tetanus. He advocates drilling the soldier in the administration of the tetanus serum by himself upon himself and others so that in case of injury he may at once be inoculated. (203)

Peculiar Manifestations. Böttiner found among the wounded coming under his observation some peculiarities not mentioned in the texts. There were certain subjective phases present. For example—some felt the impact of the projectile as a blunt force; others had a sensation of warmth in the region of the wound; two soldiers who were about to 'hurrah' found

they could not raise their right arms; some had short breath, hemoptysis, though always present, was not always accompanied by pain at the onset, it came later. The pain seemed to radiate in a most bewildering manner in every direction except to lower extremities (in most cases this was due to actual nerve injury). He found a psychic component was recognizable in some of these cases, and also states that abdominal tension was due to irritation of the intercostal muscles. It was sometimes severe on penetration of the diaphragm. (26)

Air-Darts. Modification of the weapons used brings about a corresponding change in the nature of the wounds. The use of aviators' darts has revealed a particular type of wound. These darts do not penetrate the bone but traverse the adjacent soft parts in a peculiar fashion. They may pierce a blood vessel, penetrate several important viscera at once, set up peritonitis. In the treatment, both the entrance and the exit of the dart have to be handled carefully. The former is liable to be overlooked. (455)

New Methods. A year of war worked a revolution in the army surgeon's method of dealing with the ordinary wounds of the battlefield. These, on account of the changed character of the projectiles, are more severe than in previous wars. In almost every instance of wounds from modern artillery, the broken tissues are found by the surgeon to have become infected by scraps of cloth or other material, on a scale without precedent. At the start most of the surgeons relied on astringent application or recognized methods of antisepsis to combat this infection. The *tissues were deluged* with a powerful germicide, even strong carbolic acid being employed.

The success of this method, however, was far from complete, and gradually a new system, based on well-known principles but entirely novel in application, was substituted.

One of the elementary principles of physics is that if a vessel contains two solutions of varying strength, divided from each other by an animal membrane, matter will pass from the

weaker to the stronger solution until ultimately both are the same strength. This principle was brought into action in the treatment of wounds in order to stimulate the action of the serum of the blood, which has a strong antiseptic property. The wound is filled with a water solution of salt and sodium citrate at a considerably greater concentration than that in the serum of the blood. Under the influence of this liquid the serum is poured out from the body into the wound, tending both to cleanse it and to kill the bacteria that are present.

This system has the great advantage that it leaves the tissues unimpaired by the fluids used for the destruction of the germs. "The full recognition of the efficiency of this method, introduced largely through the efforts of Sir Almroth Wright," says a medical writer, "must be regarded as one of the most important advances made in surgery as a result of the war." (Associated Press Dispatch, London.)

Makins also reports that most wounds are from shrapnel and that machine-gun wounds come next. The wounds from the former resemble very much the old musket wounds. They are easily infected. The wounds from the machine guns are usually aseptic. Most of the wounds do well. Their degree of severity varies with the velocity of the shrapnel balls at the time of impact. (143)

Sir Almroth Wright in an address stated that most wounds in the present war, referring for the most part to troops in the western campaign, are found to be heavily infected. *Streptococci* and fecal infection, especially the latter, being outstanding features. The gas-plegmon bacillus and tetanus bacillus are frequent. Of the three methods of treatment of wounds, namely by antiseptics, by vaccine therapy, by physiological methods, he considers the vaccine best. (266)

In the case of abdominal wounds great care should be exercised in deciding whether the patient should be moved. In general, these cases are not transportable. This should be impressed upon the carriers (bearers). The patient should be given neither food nor drink except as directed by the medical officer.

In case of injury do not touch the wound with the hands.

Rôle of Diseases in War.

General. Major Lelean (133) states that yellow fever carried off 50,000 out of 58,000 men in the San Domingo campaign of 1802; that in 1812 the Bavarian force mustered only 3,000 out of 28,000, owing to loss from typhus fever; that the Russians lost one-half of 120,000 men after Plevna from the same cause; that the allies lost 10,000 from cholera in the Crimean War; that in the last Balkan War the Turks lost daily from cholera, 500; that in 1828 the plague took 6,000 in one month from the Russian army; that dysentery caused 1,342 deaths and 38,000 cases of sickness in the South African War and in the same war England had 57,000 cases of enteric with 8,000 deaths; in the war of 1870–71 Germany had 73,000 enteric cases with 8,900 deaths; in the Spanish-American War 66 per cent of the typhoid cases could be traced to contact infection.

Keefer (116) claims that Montgomery and Arnold failed in their invasion of Canada in 1775 because of their great loss from small-pox and dysentery; Napoleon failed to found a colony in the southern part of the United States because 15,000 of his finest men perished from yellow fever and other tropical diseases in San Domingo in 1802; the British lost 25 per cent more from disease than any other cause in the Crimean War. In the Spanish-American War the losses from disease were seven times those from injury. It may be that the occurrence of 30,000 cases of cholera and dysentery in the Bulgarian army may account for their failure to take Constantinople. The failure of the French in their efforts to build the Panama Canal was due largely to their inability to control health conditions. Our success is due to our excellent military corps of hygiene and sanitation. The following table will indicate the rôle played by disease in war:

TABLE I

(*No. 212, Weyl's Handbook*)

Name of War	Name of Army	Deaths							
		On the Battlefield		Later from Wounds		From Sickness		Total	
		abs	o/oo K*	abs	o/oo K	abs	o/oo K	abs	o/oo K
Crimean, 1854–56	English	2755	28.2	1847	18.9	17579	179.6	22181	226.7
	French	8250	26.7	9923	32.1	59273	191.7	77446	250.4
War in Italy, 1859	French	2536	20.0	2962	22.9	13788	105.8	19286	148.7
War vs. Denmark, 1864	Prussia	442	6.6	316	4.9	310	4.9	1048	16.5
	Danes	610	11.3	836	15.5	820	15.1	2266	41.9
War in Bohemia, 1866	Prussia	2553	9.1	1455	5.2	5219	18.6	9227	32.9
Franco-Prussian, 1870–71	Germans	17255	21.2	11023	13.5	14904	18.2	43182	52.9
Russo-Turk, 1877–78	Russian: Danube	11905	20.1	4955	8.4	45969	77.6	62829	106.1
	Caucasus	?	?	1869	7.6	35572	144.3	37441	151.9
Jap-China, 1894–5	Japanese	724	12.0	231	3.8	3148	51.6	4113	67.5
Spanish-American, 1898–9	U. S.	643	3.0	325	1.5	5438	25.7	6406	30.3

* K is approximate number per thousand.

Losses United States Civil War. That we may have a more adequate idea of the real losses due to war, let us consider our Civil War. We shall present such facts as seem incontrovertible and indicate where figures presented are the best possible estimates. For Jordan has again rightly stated, "To weigh statistics is impossible, for the statistics we need have never been collected"; and we must add, conditions existing in former wars having changed, are impossible of obtaining at this date. This author states concerning the losses of the North and South:

These losses are usually estimated at about 700,000 men, divided in the proportion of 400,000 to 300,000. . . . This loss represents about two per cent of the white population of the North and about ten per cent of that

of the South. . . . This loss fell on that part of the community racially most valuable, the young men between the ages of eighteen and thirty-five.

A study of statistics relative to the losses of the North and South will serve to emphasize the conclusion given previously.

When the war closed, there were in the field, on the 30th day of April, 1865, 1,000,516 men actually in service and an enrollment of 2,245,063 men subject to draft. This would make the total fighting force of the free states between the ages of eighteen and forty-five and in good physical health and not including foreigners not naturalized, to be 3,245,579 men.

CASUALTIES

Deaths from wounds	96,089
Deaths from diseases	184,331
Desertions	199,045
Honorably discharged	174,577
Discharged for disability	224,306
Dishonorably discharged	5,390
Resignations	22,281
Missing, etc.	7,063
Total	914,082

Above refers to Union army only. (250, p. 267)

Summary of the number of men called for by the President of the United States; and furnished by, and credited to, the states and territories during the War of the Rebellion (182). (See table, page 71.)

States and Territories	Quota	Men		Total	Aggregate Reduced to a three years' standard
		Furnished	Paid commutation		
Maine	73,587	70,107	2,007	72,114	56,776
New Hampshire	35,879	33,937	692	34,629	30,349
Vermont	32,074	33,288	1,974	35,262	29,068
Massachusetts	139,035	146,730	5,318	152,048	124,104
Rhode Island	18,898	23,236	463	23,699	17,866
Connecticut	44,797	55,864	1,515	57,379	50,623
New York	507,148	448,850	18,197	467,047	392,270
New Jersey	92,820	76,814	4,196	81,010	57,908
Pennsylvania	385,369	337,936	28,171	366,107	265,517
Delaware	13,935	12,284	1,386	13,670	10,322
Maryland	70,965	46,638	3,678	50,316	41,275
West Virginia	34,463	32,068	.....	32,068	27,714
District of Columbia	13,973	16,534	338	16,872	11,506
Ohio	306,322	313,180	6,479	319,659	240,514
Indiana	199,788	196,363	784	197,147	153,576
Illinois	244,496	259,092	55	259,147	214,133
Michigan	95,007	87,364	8,000	89,372	80,111
Wisconsin	109,080	91,327	5,097	96,424	79,260
Minnesota	26,326	24,020	1,032	25,052	19,693
Iowa	79,521	76,242	67	76,309	68,630
Missouri	122,496	109,111	.....	109,111	86,530
Kentucky	100,782	75,760	3,265	79,025	70,832
Kansas	12,931	20,149	2	20,151	18,706
Tennessee	1,560	31,092	.....	31,092	26,394
Arkansas	780	8,289	.....	8,289	7,836
North Carolina	1,560	3,156	.....	3,156	3,156
California	.....	15,725	.....	15,725	15,725
Nevada	.....	1,080	.....	1,080	1,080
Oregon	.....	1,810	.....	1,810	1,773
Washington Territory	.....	964	.....	964	964
Nebraska Territory	.....	3,157	.....	3,157	2,175
Colorado Territory	.....	4,903	.....	4,903	3,697
Dakota	.....	206	.....	206	206
New Mexico	.....	6,561	.....	6,561	4,432
Alabama	.....	2,576	.....	2,576	1,611

States and Territories	Quota	Men		Total	Aggregate Reduced to a three years' standard
		Furnished	Paid commutation		
Florida	.....	1,290	.....	1,290	1,290
Louisiana	.....	5,224	.....	5,224	4,654
Mississippi	.....	545	.....	545	545
Texas	.....	1,965	.....	1,965	1,632
Indian Nation	.....	3,530	.....	3,530	3,530
Colored Troops	.....	93,441	.....	93,441	91,789
Total	2,763,670	2,772,408	86,744	2,859,132	2,320,272

(182 pp. 10–11.)

The numbers given opposite 'colored troops' in the foregoing table show, not the total number of colored troops enlisted, but simply the number of those who were organized at various stations in the states in rebellion, and who could not be at the time, and were not, assigned or specifically credited to states.

The total number of colored troops enlisted during the war was 186,097.

In the regular army there were enlisted during the war about 67,000 men; of these, probably not more than two-thirds were credited to the states.

For the men furnished for service for a shorter period than ninety days, with a few exceptions, states received no credit. Many men were furnished for service of thirty days, notably in the summer of 1863. How many men were thus furnished it is not practicable to state, but an estimate may be based on the number (17,213 officers and men) furnished by the state of New York. . . .

Nevertheless, it is safe to say that the total number of men furnished by the states and territories for the armies of the United States, after deducting those credited for service in the navy, will exceed 2,850,000 men.

In this number, men who re-enlisted are counted twice or even oftener. To give the number of individual persons who served in the army during the war is not practicable, nor is it of any practical benefit.

Indicative of the type of men constituting the volunteers, we may offer the evidence of a Secretary of War. (182 p. 23)

The Secretary of War, in his report dated November 22, 1865, makes the following remarks, which show more than anything else the spirit animating the people of the loyal states: "On several occasions, when troops were

promptly needed to avert impending disaster, vigorous exertion brought them into the field from remote states, with incredible speed. Official reports show that after the disasters on the Peninsula, in 1862, over 80,000 troops were *enlisted*, *organized*, *armed*, *equipped* and *sent* into the field in less than a month. Sixty thousand troops have repeatedly gone into the field within *four weeks*. Ninety thousand infantry were sent to the armies from the five states of Ohio, Indiana, Illinois, Iowa and Wisconsin *within twenty days*. When Lee's army surrendered, thousands of recruits were pouring in, and men were discharged from recruiting stations and rendezvous in every state."

We have quoted the data given by one author as to the losses. We find a difference in figures due to different times and methods of getting them. From cumulative evidence from the Adjutant-General's office and that of the Surgeon-General a more accurate estimate of the total deaths of the Union army in round numbers is 313,000. (182 p. 71)

In his work, 'Strategos', Lieutenant Totten, of the United States army, computes the *annual* loss per one thousand men of mean aggregate strength, actually enrolled or engaged, to have been as follows:

	Regulars	Volunteers	White	Colored	Mixed
General mortality	47.6	75.4	74.6	176.3	79.7
Killed in battle	19.9	18.8	18.9	10.6	18.4
Died of wounds	11.7	11.2	11.2	10.8	10.8
Total loss by death, per 1,000 men per annum	79.2	105.4	104.7	197.7	108.9

Killed in action, 1 man out of every 42.7 effective and actively engaged men

Died of wounds, 1 man out of every 38.1 effective and actively engaged men

Died of disease, etc., 1 man out of every 13.5 men of total the force furnished

Captured, etc., 1 man out of every 10.2 of total force furnished (men effective and actively engaged)

Wounded in action, 1 man out of every 6.7 of total force furnished (men effective and actively engaged)

Died while a prisoner, 1 man out of about every 7.0 captured

Died while in service, 1 man out of every 9.3 men of the total force furnished (182 p. 72)

DEATHS IN HOSPITALS (182, pp. 72–73)

In the hospitals of the army 6,049,648 cases were treated by the officers of the medical department, and the deaths have been classified by the surgeon-general as follows:

	White Troops		Colored Troops		Total Deaths
	Cases Treated	Deaths	Cases Treated	Deaths	
CLASS I.—*Zymotic Diseases*					
Order No. 1, Miasmatic Diseases; this order is again divided into 23 divisions	3,285,376	92,150	369,659	16,537	108,687
Order No. 2, Enthetic Diseases; divided into 7 sub-divisions	192,504	162	14,948	37	199
Order No. 3, Dietetic Diseases; subdivided into 6 divisions	42,944	1,124	16,460	416	1,540
CLASS II.—*Constitutional Diseases*					
Order No. 1, Diathetic Diseases; sub-divided into 8 divisions	288,287	1,226	35,922	581	1,807
Order No. 2, Tubercular Diseases; divided into 3 sub-divisions	19,890	5,418	3,859	1,296	6,714
CLASS III.—*Parasitic Diseases*					
Divided into 5 divisions	35,669	8	3,810	6	14
CLASS IV.—*Local Diseases*					
Order No. 1, Diseases of nervous system; divided into 13 subdivisions	170,032	4,442	23,926	815	5,257
Order No. 2, Diseases of eye; sub-divided into 7 divisions	88,701	2	7,599	1	3
Order No. 3, Diseases of ear; 5 divisions	28,918	6	2,080	1	7
Order No. 4, Diseases of organs of circulation; 11 divisions	25,106	1,658	1,559	467	2,125
Order No. 5, Diseases of respiratory organs; 11 divisions	448,923	17,902	55,189	6,198	24,100

	White Troops		Colored Troops		Total Deaths
	Cases Treated	Deaths	Cases Treated	Deaths	
Order No. 6, Diseases of Digestive organs; 23 divisions	563,239	4,146	54,271	971	5,117
Order No. 7, Diseases of urinary and genital organs; 13 divisions	29,875	430	3,016	131	561
Order No. 8, Diseases of bones and joints; 9 divisions	8,079	47	950	15	62
Order No. 9, Diseases of integumentary system; 7 divisions	189,817	216	11,760	27	243
CLASS V.—*Wounds, Accidents, and Injuries*					
Order No. 1, Wounds, accidents and injuries: 16 divisions	400,933	36,688	24,337	1,427	38,115
Order No. 2, Homicide		144		30	174
Order No. 3, Suicide		301		9	310
Order No. 4, Execution of sentence		104		39	143
Unclassified diseases	7,187	449			449
Total	5,825,480	116,623	629,354	29,004	195,627
Of these cases and deaths, there occurred in the year ending June 30, 1866	245,954	4,735	159,232	5,539	10,274
Leaving cases and deaths, from May 1, 1861, until June 30, 1865	5,579,526	116,888	470,122	23,465	185,353

The largest number of deaths occurred from the following diseases: (182, p. 74)

	White Troops	Colored Troops	Total
Of Class I			
Typhoid fever, Order No. 1	27,056	2,230	29,336
Typho-malarial fever, Order No. 1	4,059	1,301	5,360
Remittent fever, Order No. 1	3,853	1,002	4,855
Congestive intermittent fever, Order No. 1	3,370	794	4,164
Acute diarrhœa, Order No. 1	2,923	1,368	4,291
Chronic diarrhœa, Order No. 1	27,558	3,279	30,836
Acute dysentery, Order No. 1	4,084	1,492	5,576
Chronic dysentery, Order No. 1	3,229	625	3,855
Erysipelas, Order No. 1	1,860	247	2,108
Small-pox and varioloid	4,717	2,341	7,058
Measles, Order No. 1	4,246	931	5,177
Of Class II			
Consumption, Order No. 2	5,286	1,211	6,497
Of Class IV			
Inflammation of Brain, Order No. 1	1,269	262	1,531
Inflammation of Lungs, Order No. 5	14,738	5,233	19,971
Of Class V			
Gun-shot wounds, Order No. 1	32,907	1,042	33,949
Total	141,155	23,408	164,563

The foregoing tables do not embrace those who died of wounds or diseases while prisoners of war, or those who died while on furlough, leave of absence or absence without leave.

DISCHARGES FOR DISABILITY

The Adjutant-General, in his report dated October 25, 1870, gives the number discharged for disability during the war as 285,245 men, as follows:

Enlisted men of the regular army	6,541
Enlisted men of the volunteer army	269,197
Enlisted men of the colored troops	9,807

We can not obtain data with reference to the Confederate forces and their losses, which are complete or entirely satis-

factory. Their country was devastated, occupied by the enemy. There were no local means of keeping records and the whole resources of the South were being used in the procedure of war. We are therefore compelled to present what seem reasonable estimates from which conservative inferences may be drawn.

In February, 1865, the superintendent of the Bureau of Conscriptions reported to the Secretary of War in detail by classes the number of persons exempt from conscription by physical disability or by law, or detailed in each state east of the Mississippi, the total of which (including 4,612 detailed in government bureaus and departments) was 87,863. The minuteness of this report makes it impossible to believe that any considerable number who were not exempt from military service escaped the search of the Bureau of Conscription, and—taken in connection with urgency shown in the legislation and correspondence above set out—it warrants the assertion that, in that part of the Confederacy east of the Mississippi, substantially *every male white from seventeen to fifty* was swept into the ranks of the Confederate Army, except the 87,863 exempts, and those who were in hiding or had joined the Union Army. (136, p. 18)

RATIO OF ESTIMATES OF CONFEDERATE NUMBERS TO NUMBER OF UNION ENLISTMENTS

(136, p. 40)

Estimate of Confederate Numbers	Men in Confederate Army	Enlistment in Union Army	Per cent
Marcus J. Wright	600,000 to 700,000	2,898,304	20:24
Early, Stephens and Jones	600,000		20
Partial Estimate	885,000		30
Estimate from the Census, about.	1,234,000		41
Estimate from the number average strength of regiments	1,227,890 or 1,406,480		41 or 47
Estimate of War Records Office	1,000,000		34
Cassellman	1,500,000		50

This author gives as an estimate from Confederate sources, 94,000 as killed or mortally wounded, which upon the usual basis would bring the total of killed and wounded to about 329,000. His calculations show more Confederate soldiers hit in engagement with Northern troops. Preponderance of numbers on the part of the latter partially explains this. When one considers that even the young boys of the South, practically all the males (white), were in arms, that their organization was such as to leave little means for adequate medical treatment and care, it is but reasonable to infer that their losses from wounds and diseases would be proportionately greater than those of the North. Adequate facts concerning home conditions in a medical way are lacking in both North and South. But it must follow that the people left at home in the South, deprived of the service of their medical men, forced into a life to which they were unaccustomed, foraged upon by the invaders, forced to give out of their poverty, suffered not only from privation and from local diseases but from those incident to a marching troop bent on a policy of devastation and to some extent pillage.

As a source of data bearing upon all social phases of war and especially losses due to it from diseases, etc., we present herewith an outline of Dr. Schwiening's article:

212 von Schwiening Dr. H. Krieg und Friede (War and Peace). Handbuch der Hygiene von Dr. Theodor Weyl IV. Supplement band, Soziale Hygiene, 1904, pp. 655–726. Jena. Gustav Fischer,

WAR AND PEACE

I. Influence of war and peace in destructive respects:
   1. Directly
      a. Through loss of disabled and dead
      b. Through loss of invalids
   2. Directly through its influence upon
      a. Marital relations
      b. Births
      c. Deaths
      d. Emigration (inferential)

II. Influence of war and peace in epidemic respects:
   1. In general
   2. In particular
      a. Leprosy
      b. Syphilis
      c. Plague
      d. .....
      e. English Sweating Sickness
      f. Hungarian Sickness
      g. War Typhus
      h. Cholera
      i. Small pox
   3. Prophylaxis against the spread of contagion through war
   4. Battlefield hygiene

III. Influence of war in social and moral statistical respects:
   1. Alcohol
   2. Prostitution
   3. Immorality (assaults against decency)
   4. Mental diseases
   5. Suicide

IV. Influence of war and peace in hygienic respects:
   1. Conduct of hospitals
   2. Attendants
   3. Hygienic means of nourishment.

CLOSING REMARKS:

Literature (excellent bibliography of 148 titles)

III. ECONOMIC RESULTS OF WAR

Burden Upon the Whole People—Economic, Social, and Moral

Indicative of the general results along economic lines of all wars are the data given by the Balkan Commission. Their exposition deserves careful consideration.

Cost of the Balkan War. From the economic point of view war is a destruction of wealth.

Even before war is declared the prospect of conflict between the countries in which serious difficulties have arisen, affects the financial situation. Anxiety is aroused and failures are caused on the market by the fluctuations of government and other securities of the states concerned. Credit facilities are restricted; monetary circulation disturbed; production slackened, orders falling off to a marked degree; and an uncertainty prevails which reacts harmfully on trade.

Then comes the declaration of war and mobilization. The able-bodied men are called to the standards; between one day and the next work stops in the factories and fields. With the cessation of the breadwinner's wages, the basis of the family budget, the wife and children are quickly reduced to starvation, and forced to seek the succor of their parishes or the state.

The whole of the nation's activities are turned to war. Goods and passenger traffic on the railroads come to an end; rolling stock and rails are requisitioned for the rapid concentration of men, artillery, ammunition and provisions at strategic points.

Not only does the country cease to produce, but it consumes with great expense in the hurry of operations. Its reserves are soon exhausted; the taxes are not paid. If it can not appeal for loans or purchases abroad, it suffers profoundly.

Then the fighting begins, and with it the hecatombs of the battlefields, the earth heaped with dead, the hospitals overflowing with wounded. Thousands of human lives are sacrificed; the young, the strongest, who were yesterday the strength of their country, who were its future of fruitful labor, are laid low by shot and shell. Those who do not die in the dust or mud, will survive, after countless suffering, mutilated, invalided, no longer to be counted on for the prosperity of the land. And it is not only the population, that essential wealth, that is thus annihilated. In a few hours armies use up for mutual destruction, great quantities of ammunition, while highly expensive supplies of cannon, gun carriages and arms are ruined. There is

a destructive bombardment of towns, villages in flames, the harvest stamped down or burned, bridges, the most costly items of a railway, blown up.

The regions traversed by the armies are ravaged. The non-combatants have to suffer the fortunes of war; invasion, excesses and it may be flight, with the loss of their goods. Thousands of wretched families seek security at the price of cruel fatigue and the loss of everything—their land and their traditions—acquired by the efforts of many generations.

The Commission arrived in the Balkans after the fighting was over, and was able to study the results of war at the very moment when, the period of conflict closed, each nation was beginning to make its inventory. . . . Nevertheless, the traces of the war were still fresh. The Commission noted them. If the corpses of the victims were not visible their countless graves were everywhere, the mounds not yet invaded by the grass that will next summer hide them away. Visible, too, were the wounded in the hospitals and the mutilated men in the streets and on the roads; the black flags, hanging outside the doors of the hovels, a dismal sign of the mourning caused by the war and its sad accompaniment, cholera.

The Commission has endeavored to make an estimate of the cost of the double war. Instruction on this head is needful. Public opinion needs to be directed and held to this point. It is too easily carried away by admiration for feats of arms, exalted by historians and poets; it needs to be made to know all the butchery and destruction that go to make a victory; to learn the absurdity of the notion, especially at the present time, that war can enrich a country; to understand how, even from far off, war reacts on all nations to their discomfort and even to their serious injury. (194, pp. 235–236. See also Angell's book, *The Great Illusion.*)

The balance sheet of the war must bear at its beginning, in order to characterize it properly, the list of the dead and wounded. . . .

Below is the sinister inventory. (It should be observed that this does not account for the diseases, privations, etc., of those at home.)

Bulgaria had 579 officers and 44,313 soldiers killed. 71 officers, 7,753 soldiers are reported missing—how many of these are dead? 1,731 officers, 102,853 soldiers were more or less seriously wounded. A great number of these will remain invalids, reduced greatly in strength or deprived of a limb. . . .

Servia published first of all the following losses: about 22,000 dead and 25,000 wounded. . . On Feb. 27, 1914, the official figures were given to the Skupshtina by the Minister of War. There are 12,000 to 13,000 killed; 17,800 to 18,800 dead as the results of wounds, cholera, or sickness; 48,000 wounded.

. . . It was impossible for us to find out the figures of the Greek, Montenegrin or Turkish losses. . . . The Montenegrins are said to have had a great many killed in proportion to their number on account

of their attitude under fire. . . . From Turkey we have no official information.

This is not all. Arms were not only taken up against belligerents, but massacres took place in Macedonia and Albania. Old people, villagers, farmers, women and children, fell victims to the war. . . .

It is not possible to compute, chapter by chapter, the extent of the material losses by destruction of property. (194, pp. 243–244)

For this reason the best we can do is to present a table of the costs, estimated by the various contending nations. Of these reports the Commission says:

They are evidently open to the suspicion of being exaggerated. . . . Thus in a document sent us by the secretary-general to the Servian foreign minister (Appendix I) the total of the various heads under which war expenditure is classified amounts to but fr. 445,880,858, a reduction of fr. 128,934,642 on the total sent into the Finance Commission.

In the absence of documents it is to be presumed that Montenegro cannot have spent fr.103,000,000 even if its reserves were possible in the country requisitioned. (194, pp. 260–261) (See table next two pages)

RECAPITULATORY TABLE OF THE CLAIMS FOR PECUNIARY COMPENSATION MADE BY THE BALKAN STATES AS THE RESULT OF WAR OPERATIONS (194, p. 398)

Heads of Claims	Bulgaria	Greece	Montenegro	Servia	Total
	Francs	Francs	Francs	Francs	Francs
I. Claims relating to military expenditures					
1. Expenditures on army.....	824,782,012.20	317,816,101.00	100,631,100.00	574,815,500.00	1,818,044,713.20
2. Expenditures on navy.....	.....	75,341,913.00	.....	.....	75,341,913.00
3. Pensions	471,870,653.00	54,000,000.00	.....	.....	525,870,653.00
4. Damage caused by the cruiser 'Hamidieh'.....	.....	504,600.00	.....	.....	504,600.00
Totals.....	1,296,652,665.20	447,662,614.00	100,631,100.00	574,815,500.00	2,419,761,879.20
II. Other claims presented by the states as states					
1. Repatriation of refugees and Ottoman subjects...	.....	2,000,000.00	.....	2,000,000.00	4,000,000.00
2. Maintenance of prisoners of war.....	15,992,783.28	20,000,000.00	2,500,000.00	16,000,000.00	54,492,783.28
3. Indemnity for wagons seized	.....	.....	.....	879,668.33	879,668.33

RECAPITULATORY TABLE OF THE CLAIMS FOR PECUNIARY COMPENSATION MADE BY THE BALKAN STATES AS A RESULT OF WAR OPERATIONS (194, p. 398) [*Continued*]

4. Indemnity for materials of war seized	.....	.....	.....	5,287,759.80	5,287,759.80
Totals	15,992,783.28	22,000,000.00	2,500,000.00	24,167,428.13	64,660,211.41
III. Pecuniary compensation claimed on account of damage caused to individuals					
1. Damage caused to the inhabitants of Epirus	.....	10,996,370.00	.....	.....	10,996,370.00
2. Damage caused to Balkan subjects	.....	41,000,000.00	.....	2,000,000.00	43,000,000.00
3. Restitution of the funds of the Agricultural Bank	.....	.....	.....	.....	.....
4. Damage resulting from the detention of vessels	.....	26,555,912.00	.....	.....	26,555,912.00
Total	.....	78,552,282.00	.....	2,000,000.00	80,552,282.00
General Totals	1,312,645,448.48	548,214,896.00	103,131,100.00	600,982,928.13	2,564,974,372.61

The Balkan wars simply emptied the factories and fields of their male workers. Out of 2,632,000 inhabitants, Greece mobilized 210,000 men; Bulgaria 620,657 out of its 4,319,108 inhabitants; and Servia 467,630 men out of 2,945,950 inhabitants. The result was a considerable deficit in the taxes collected, a falling off in the state receipts. We will quote the example of only one country, Servia, the same phenomenon having occurred to the same extent in the other belligerent countries. Servia experienced the following variations in its monetary resources. Taxation produced 2,879,-577 dinars in the month of October, 1913, against 591,315 in the corresponding period of 1912, and 5,817,493 in 1911; that is, an increase in 1913 of 2,188,251 dinars on the results of 1912.

In the first ten months of the year 1913, taxation which had brought in 33,911,817 dinars in 1911, and 24,443,984 dinars in 1912, only brought in 10,623,800 dinars. The decrease of 13,820,184 dinars between the figures for 1913, and those for the year before, is explained by the peculiar circumstances. In 1912, the taxes were in fact regularly paid for the first nine months, whereas during the greater part of the corresponding period of 1913, Servia was in a state of war.

Then, too, war, besides depriving states of their ordinary receipts, causes the heavy expenditure on armaments, ammunition and equipment; . . . (194, pp. 259–260)

Finally, the Balkan states, immediately after the war, took up the position of conquerors; in Belgrade, in Athens, and in Sophia, the sovereign and the troops made triumphal entries.

Today the Balkan states are acting as beggars. They are seeking to borrow money to pay their debts and build up again their military and productive forces.

Such is the result of war. Hundreds of thousands of deaths, soldiers crippled, ruin, suffering, hatred, and to crown all, misery and poverty after victory. War results in destruction and poverty in every direction. (194, p. 264)

These conditions, existing at the close of the Balkan wars, are not being recovered from in the present. Again are these regions the scene of conflict, carnage, and devastation. The hatreds, etc., so well described by the Commission, are now expressing themselves in the part these nations are taking in the present great conflict. We have shown in a previous section the awful lack of physicians, not merely to take care of the troops but to look after the civilian population. The long-continued drain upon Servia, for example, has involved far more than the number previously mentioned as mobilized for the Balkan wars. Perhaps the following statement attri-

buted to Prince Regent Alexander is more literally true than estimates usually are:

> Rome, March 20, 1915. Servia has lost nearly 1,000,000 of her 5,000,000 people through death by sword, through starvation, or in the typhus epidemic. . . . The remaining 4,000,000 face starvation.

Such devastation gives rise to economic, social, and physical losses, human and brute, that are irremediable.

The Cost of the Spanish-American War. But let us consider the losses nearer home in a struggle that as a war ranks as a very minor affair indeed. So little have we been informed of its cost that few realize the load that it has placed upon us, not only in problems of military policy with reference to the remainder of the world but in the mere fact of the cost of living now. Our abominable system of indirect taxation to which we cling with almost fetishistic worship prevents, in many cases, a true appraisement of the real cost to the community and the individual.

> The war with Spain for the liberation of Cuba was entered into from patriotic motives, and may have been inevitable. It was lawfully declared by congress, and was marked by few of the necessary barbarities of warfare. The destruction of the two sections of the Spanish navy marked the change in naval warfare in which, while the admiral or commander of the fleet has the opportunity to display judgment and courage, yet in the actual attack he must of necessity become the subordinate of the engineers who work the machinery. In neither engagement was there any equal contest, only an example that the man behind the guns must not only have the courage which is a common attribute, but the greatest technical skill and practice in the working of complex mechanism. In fact, in the engagements, the Spaniards showed the high courage of their race in a hopeless struggle to meet the superior skill and mechanism of their opponents. (9, p. 150)

The present conflict is emphasizing the truth of the above quotation. All the glamour of contest is removed from present war, thus preventing the functioning of those factors so often credited with the power of bringing out the best in men. At the present time, war is an encourager of fatalism. It should also be recalled that this same fleet which proved so superior had been and was at that time decried as inefficient, inade-

quate, with the same sort of vehemence and lamentation as that employed by the present-day advocates of military preparedness in the United States.

From an investigation "compiled, computed, and proved from the official reports of the government," Atkinson estimates the cost of war and warfare from 1898 to 1902 inclusive at twelve hundred million ($1,200,000,000) dollars.

COMPARISON OF PER CAPITA EXPENDITURES

(9, p. 148)

	All Expenditure	Civil	Army	Navy	Interest	Pensions
1878 to 1898 [20 years of peace]	$5.00	$1.48	$0.75	$0.35	$1.90	$2.42
1898 to 1902 [5 years of war]	6.67	1.53	1.95	0.86	0.47	2.33
Variation, 1898-1902	+ $1.67	+ $0.05	+ $1.20	+ $0.51	− $1.43	− $0.09

Excess of the cost of war and warfare over normal rates of peace computed at $2.50 per head year by year.

COMPARISON OF FIVE YEARS OF WAR ON THE NORMAL RATE OF $2.50 PER HEAD IN TIME OF PEACE WITH INTERESTS AND PENSIONS ACTUAL

(9, p. 149)

	1898	1899	1900	1901	1902
Normal cost, government	$2.50	$2.50	$2.50	$2.50	$2.50
Pensions and interest	2.49	2.42	2.37	2.21	2.11
Estimated, normal	$4.99	$4.92	$4.87	$4.71	$4.61
ACTUAL	6.08	8.14	6.39	6.57	5.96
	+$1.09	+$3.22	+$1.52	+$1.86	+$1.35

RELATIVE TAXATION IN THE UNITED KINGDOM, FRANCE, AND GERMANY, AS COMPARED TO THE UNITED STATES

(9 pp. 168–169)

From a similar official statement of the national expenditures of the republic of France, the following computations are derived for the year 1901:

France

Population	38,600,000	
	Total	*Per capita*
Civil and judicial service	$116,390,696	$ 3.00
Army, navy, public works, forts, etc.	234,925,682	6.10
Interest on public debt and pensions, omitting workmen's old-age pensions	257,608,381	6.67
	$608,924,759	$15.77
Expenditures for state manufactures, subsidies to merchant marine, to free art schools and to four religious cults, etc., carry the per capita to over		$17.00

Great Britain

From an official statement of the expenditures of the united kingdom of Great Britain and Ireland, the following computations are derived for the year ending March 31, 1901:

Population computed at	41,500,000	
	Total	*Per capita*
Expenditures for civil and judicial services, omitting imperial taxes appropriated to local purposes	$114,457,860	$ 2.76
Army and navy under normal conditions of peace	230,159,880	5.54
Interest on national debt and pensions	134,330,400	3.24
	$478,948,140	$11.54
The special war expenditures of the year are estiestimated at	317,116,460	7.64
Total	$796,116,600	$19.18

In the present year this burden will be somewhat lessened, but by comparison with the United States fiscal year, ending June 30, 1901, the British rate is $19.18 per head against the United States rate of $6.57, now also lessened (1905).

The author, in absence of official statements of expenditures, estimated the per capita expenditure of Germany at $12.00. He says:

Twelve dollars in Germany falls on a per capita product not over half our own; $17.00 in France, on a product not over three-fifths; $11.54 to $13.00 in the United Kingdom in time of peace, $17.00 in time of war, on a product per capita not over three-quarters, if as much.

The nemesis of the rule of blood and iron—revanche, junkerism, and militarism—hangs like a pall over continental Europe, and the words 'Disarm or starve' are written upon the battlements on land and on the battleships upon the sea.

This being the condition at that time, the awfulness of the present conflict should impress itself upon us with greater vividness.

COST PER CAPITA OF THE GOVERNMENT BY TERMS OF ADMINISTRATION

(9, p. 155)

1878 to 1897 inclusive	President Hayes	$5.21
	President Arthur	4.73
	President Cleveland	4.43
	President Harrison	5.36
	President Cleveland	5.18
Average of twenty years of peace, order, and industry		$5.00

MILITARY EXPENDITURES

(9, p. 156)

1878 to 1897	President Hayes	$0.77
	President Arthur	0.80
	President Cleveland	0.66
	President Harrison	0.76
	President Cleveland	0.77
Average of twenty years of peace, order, and industry		$0.75

NAVAL EXPENDITURES

(9, p. 157)

1878 to 1897	President Hayes	$0.31
	President Arthur	0.29
	President Cleveland	0.24
	President Harrison	0.42
	President Cleveland	0.44
Average of twenty years of peace, order, and industry		$0.35

SUMMARY OF TWENTY YEARS OF PEACE

(9, p. 159)

	President	Civil	Military	Naval	Total
1878 to 1897 inclusive	Hayes	$1.33	$0.77	$0.31	$2.41
	Arthur	1.45	0.80	0.29	2.54
	Cleveland	1.43	0.66	0.24	2.33
	Harrison	1.66	0.76	0.42	2.84
	Cleveland	1.48	0.77	0.44	2.69
Average		$1.48	$0.75	$0.35	$2.58
Less non-recurrent items					0.08
Normal rate					$2.50

As the author points out, the cost of the navy which conquered and destroyed the Spanish fleets is included in this period.

Continuing the discussion of his data, Atkinson states (9, p. 177):

The estimates in that treatise have been more than justified by the official statements of the Secretary of the Treasury in his computations of the expenditures to June 30, 1904, by which it appears that the average per head of the present year will be $6.29.

It also appears that the estimates presented by the departments for the fiscal year ending June 30, 1905, if not exceeded, will be $6.76.

The actual difference between the normal rate previous to the Spanish-American war and the average of $6.58 for seven years of active and passive war and warfare would be, per head, $1.58 (italics author's).

But during the eight years of Harrison and Cleveland the annual cost of pensions and interest was, per head, $2.50.

In the fiscal year ending June 30, 1903, pensions and interest were less per head, than $2.00. Reduction, $0.50.

Both charges are now rapidly diminishing, and the normal cost of government, without war and warfare, in 1903 and 1904, estimated at $6.29, would not have exceeded $4.29 on a basis of peace, order, industry and good government, economically administered.

The cost of passive war and warfare is now over *two dollars per head*, now being assessed on nearly 82,000,000 people, or over $160,000,000.

On the 30th of June, 1904, the cost of war and warfare, active and passive, will have been $1,000,000,000 and even if the appropriations for the year 1905 are not exceeded at the end of the fiscal year, it will have been nearly $1,200,000,000.

We may take off $100,000,000 for expenditures now being made for a useful purpose which were not made before the Spanish war, such as irrigation, national parks, the expansion of the Department of Agriculture, and the possibility that the consular service may be reorganized, with suitable compensation to competent men. . . .

The total expenditures during the four years of the Civil War and the four subsequent years of reconstruction, fiscal years June 30, 1862 to June 30, 1869 inclusive, were a small fraction over four thousand nine hundred million ($4,900,000,000) dollars stated in the Treasury Report. But it must be observed that all the supplies, armaments, and construction of vessels during that period were paid in the depreciated paper money, the issue of which caused a very great advance in prices. Many years since I made a close estimate of the additional cost of the Civil War which could be attributed to the depreciation of legal tender notes. I made it out about one thousand million ($1,000,000,000) dollars, a very conservative estimate.

We may deduct from the gross sum of the expenditures during the Civil War, and the period of reconstruction seven hundred million ($700,000,000) dollars, bringing the total cost on a gold basis to forty-two hundred million ($4,200,000,000) dollars.

The expenditures for the same specific purposes for the eight years of war and warfare, June 30, 1898 to June 30, 1905, on actual figures and appropriations, will have been the same sum, namely, forty-two hundred million ($4,200,000,000) dollars. (9, pp. 201–202.)

The figures emphasize not only the extreme financial cost of our petty struggle with Spain but also show how enormously the cost of carrying on such procedures is increasing.

Who Pays the Cost? This should be self-evident. Ever and ever it is he who is least able, the laboring man and woman.

The working groups of the country consists of a fraction under three, one person occupied for gain supporting two others as well as himself or herself. The average product of each person occupied for gain is approximately seven hundred dollars a year; that is a rather large estimate. It follows that three persons must get their support, pay their taxes, make their contributions to savings, and get their board and clothes out of what seven hundred ($700.00) dollars a year will cover, deducting taxes, *i. e.*, on what $225 a year will buy at retail for each person.

It follows that, if the cost of the war for five years (1898 to 1902 inclusive) had been over $700,000,000, then work equivalent to that of one million men for one year has been diverted from the productive pursuits of peace to the destructive pursuits of war.

Divide this number by five and we get the work annually of two hundred thousand (200,000) men each year for five years, during which period we may have had an average of one hundred thousand (100,000) men under arms by land and sea, thus developing the common rule that for *every man taken from productive industry into the army and navy the work or product of one other man must be diverted to the destructive purpose of war.*

This is the economic aspect of war—justifiable for defensive purposes; criminal, brutal, and barbarous when waged for offensive purposes or for the expansion of trade by conquest or colonization. (9, p. 153)

IV. THE CIVILIAN POPULATION AND WAR

SUFFERING OF NON-COMBATANTS

Loss Not Confined to Armies. But not alone does the army suffer from diseases. These are carried by the soldiers to the civilians among whom they wreak havoc. Likewise, invading armies are subjected to all the bad conditions of the population and territory they invade. Syphilis was probably introduced into Europe by Columbus on his return voyage from America, spread by Karl VIII through Italy and thence scattered throughout southern Europe. Though there is some question, it is also probable that leprosy was spread by the Crusades. In 1864 venereal cases among Prussian troops rose from 24 per thousand in time of peace to 164 in time of war. The rate in Bavaria rose from 1.56 per cent in 1864 and 1.43 per cent in 1865 to 3.29 per cent in 1866. Plague occurs with singular regularity in connection with wars. (212) It needs but a momentary consideration of the nations involved in the present war to show that many diseases among the troops will spread through the territories they now occupy, and in their native lands upon their return.

It is impossible to confine the loss to the armies involved. The entire population of the countries at war, suffers proportionately. Strange as it may seem the deaths due to worry, overwork, starvation, deprivations, etc., among the women, children, and those left at home closely approximates those of the soldiers. By no juggling of data, is it possible to get around the fact that the best, the fittest, of the population are lost and can not be replaced. War by no means provides for the survival of the fittest. At the same time we should remember that the loss in any one year due to *preventable* epidemic and infectious diseases among civilians is greater than the loss from war, especially from bullets. This should cause the employment of the same vigorous hygienic and sanitary measures in times of peace as in times of war.

Data Inadequate. Statistics relative to civil conditions during times of war have been meager and unreliable, owing to the fact that all the machinery of government is busy with war affairs. Hence facts concerning the condition of the people themselves in war times are hard to obtain. It is hoped that the organization of the governments involved in the present struggle is such that, at its conclusion, we shall have sufficient data to give us the exact condition of the people involved during and at the close of the conflict.

Indicative of what a prolonged war may do are the following statements: (212) During the Thirty Years' War, the population of Bohemia was reduced from 4,000,000 to 800,000; in many regions of Germany to-day the population has not reached the status prior to that war; the number of inhabitants of Würtemberg sank from 313,000 in 1634 to 65,000 in 1645; the average reduction was one-fourth of the population at the beginning of the war; of 80,000 in Augsburg in 1632, there were but 18,000 in 1648; in Frankenthal, of 18,000 but 324 remained. The Napoleonic wars carried disease to such an extent that the death rate exceeded the birth rate.

Effect of General Sanitary Conditions. As pointing to the interaction of health conditions in the army and in the land occupied and invaded, it may be mentioned that the British expeditionary force in the West has suffered little from epidemic diseases. There have been a few cases of enteric among the Belgians. Cholera, smallpox, and dysentery were not found up to December 6, 1914. But the influx of Belgian refugees gave rise to new problems. Verminous conditions and venereal diseases had given trouble in places. The Highland and Island troops suffered considerably from measles. In Austria and Servia, cholera and typhus have been increasing at such a rate as to cause apprehension. Unemployment, misery, sickness, ever follow in the wake of war. It is therefore necessary that civilians follow the same rigid observance of sanitation and hygiene as the army in the field and in camp. (366, 368, 374)

Home Must not be Neglected for War. War serves merely to emphasize the extraordinary necessities forced upon us. It may, in its usurpation of all of our energies, undo the work of years. Already in Germany, England, and Servia a warning note is being sounded relative to the neglect of those left at home. So many physicians and nurses have been called to the front that medical care and inspection of people, schools, factories, etc., is being omitted. This will not do, for the future of the nation depends upon the young—the children at home. It is true the authorities are awakening to the danger and are making efforts to meet it. It is to be hoped the general public will rally to their aid—inadequate though all effort must prove under the stress of war. (3, 13, 38, 102, 133, 147, 158, 197, 211, 325, 369, 374)

Dr. R. P. Strong of the Servian Sanitary Commission states that at the beginning of the war, there were 360 doctors in Servia, of whom 121 have since died (April 29, 1915) leaving 239. To these 250 foreign physicians may be added, giving a total of 509 for a population of 5,000,000. As the army takes all the time and energy of this limited number, the women and children and the men at home are untreated and neglected. (228)

German Views on School Hygiene in War. As showing the correlation of school hygiene with that of the army and general public, we can do no better than give views of some German writers in the midst of the conflict. Dr. Julius Moses calls attention to the fact that many of the excellent German schoolhouses, owing to previous hygienic administration by the school department, have been made into hospitals. He points out that school hygiene, which is scarcely more than forty-four years old, is being subjected to the test of fire and is proving its worth; for the excellent condition of the men in the field is due to their school training. Thus war is proving that hygiene, taught and practiced in years of peace not only functions then, but now during the war. He emphasizes the fact that the war has demonstrated, contrary to the opinion of some, that the youth of today are not effeminate

nor weakened. "What the present youth shows in contrast to the earlier generations, is a high degree of sensitivity (Reizsamkeit), that is, a sensitive reaction of the nerves and a finer adjustment of the mind to mental and moral influences." This sensitivity is one of the most potent factors making for modern culture. Social hygiene has been and and must continue to be considered in relation to school hygiene. In fact this will be one of the great problems for solution at the close of the war. (158)

We should then, this writer urges, instill into the minds of the youth, the necessity of cleanliness, etc., that they may help fight the contagious and infectious diseases in the home and out of it. We should emphasize light, air, dustlessness, and cleanliness. In order that best results may be obtained from the sick and wounded, it is necessary that they have knowledge, discipline, and strength of will to obey medical instructions. And here drill from school hygiene functions. It is for those who have to remain at home to see that all the elements of German culture are preserved through the school and otherwise.

Along similar lines is the discussion of school hygiene in time of war by Dr. Adolph Baginsky. He indicates that many of the special institutions for the care of children, etc., have been turned over to the war department for military use. In view of the increased work of the mothers, it will be necessary for many of the children to be taken care of, not merely during the day but also during the night. Kindergartens may do this to some extent. It is important that wash and bath facilities be provided. Children who stay for nights should have undisturbed sleep. Of course, cleanliness must be maintained and the nourishment of the children carefully watched. In striking contrast with the views of those American teachers and writers who would inject the war into the curriculum at every possible point is the opinion of this hygienist that, "The less disturbance the school suffers from military procedure—the less it is observed in school—the better." The school must make allowance for the increased

irritability in children whose fathers are away at the front, who are performing strenuous duties by reason of this absence, etc. Baginsky asks, "Is there a war psychosis? Does it spread from house to house, from family to family?" It is to be expected that this tense period, this excitable state, will be accompanied by hallucinations, etc. (13)

It is then the duty of teachers properly to direct these forces at work. They should watch the nervous children. They should protect the child from fatigue, from too much home work, from school tenseness and school discipline and from idle street life. It will be necessary to provide school feeding more and more. Baginsky does not favor a system of gymnastics built on military lines. He thinks the English ideals of sport are better and give the best results.

Even though in the stress of war, Germany must consider not only making the youth healthy and strong, but also the treatment of childrens' diseases, writes Dr. Altschul. No present means of treatment—forest and open air schools, etc. —should be omitted. Though the question of a decreasing birth rate due to war is mooted, the fact remains that it will be necessary to recruit the army from the coming generation. (3)

In the rush of women to be nurses, to take care of the sick, etc., they should not forget that the greatest benefit for the country is yet to be found in the proper care of its young. Germany must take care, in the economy which must be practised at this time, that she does not make the children suffer and thereby impair the prospects of good future citizens. Dr. Altschul urges that the mothers and babies must be taken care of. Teachers should post themselves on proper hygiene and coöperate with the physicians. Nurses and women who volunteer should be requisitioned for work with the children. Teachers should give instruction and training, especially of the body, through all sorts of exercises, games, etc. He suggests that inattention is often a symptom of illness. Soon a large number of orphans must be cared for and when these, at the age of fourteen become more or less free, another large

problem will confront Germany. He suggests that possibly these may be taken care of in rural colonies thus educating the children and at the same time giving help to the country workers. He points out, too, that the weak, the defectives, etc., can not receive the attention needed. He concurs with Baginsky in advising the non-emphasis of war in the school curriculum. It is well to avoid making too strenuous appeals to the imagination of pupils in these stirring times, especially at the age of puberty.

FOOD

Kinds and Amount. Quoting from Parkes, Woodhull (259) gives the following ration requirement:

	Garrison	*Field*
	oz.	
Albuminates (flesh)	4.31	6–7
Hydrocarbons (fats)	3.53	3.5–4.5
Carbohydrates (starch and sugar)	11.71	16–18
Salts	1.10	1.2–1.5
	20.65	26.7–31

The following is a ration suggested by medical officers:

	Proposed	*Now used*
	oz.	oz.
Fresh beef or other fresh meat	20	20
or Salt beef	20	22
or Pork and bacon	12	12
Flour	22	18
or soft bread	22	18
except on fatigue when *F. or S. Br.*	24	
or hard bread	16	16
and flour	4.8	
or corn meal	24	20
Beans or peas	2.4	2.4
or money value in milk, fresh, canned, cheese		
Potatoes, 60 pounds to 100 rations	9.6	16
or value in fresh or dried fruit		
Rice	1.6	1.6
or value in fresh vegetables		
Sugar	2.4	2.4
Coffee, green	1.6	1.6
or roasted	1.28	1.28
or tea	0.24	0.24
In addition the soldier should have candles, soap, pepper, etc.	3.5	3.5

We find divergence in statistics offered as to present army rations. One writer in *World's Work* gives the following (365):

Russian —4929 calories
French —3340 calories
English —3292 calories
German —3147 calories
Austrian—2620 calories

He also states that the American and British rations are about the same, being as follows: Bread 1 pound, meat without bone ¾ pound, preserved 17 ounces, 12 cents per day mess allowance. He also points out the necessity for proper

amount of water. The evaporation of each 2 grams of water extracts 1 calorie of heat from the body. As approximately 90 calories of energy are used in a mile march, 180 grams of water are evaporated or used. In a 6-mile tramp this amounts to 1¾ pints, about 1-40 of body weight. He further points out that every pound added to the load carried increases the energy expenditure at the rate of 4.5 calories (small) per minute.

The following is stated to be the war prisoners' ration in England: Bread 1½ pounds, or biscuits 1 pound, fresh or frozen meat 8 ounces or preserved ½ ration, fresh vegetables 8 ounces, butter or margarine 1 ounce, tea ½ ounce or coffee 1 ounce, sugar 2 ounces, salt ½ ounce.

For the purpose of obtaining a proper ration, the British experimented with two sets of men. In the first experiment were 20 volunteers and 4 officers of the R. A. M. Corps who practised marching in October during which there was continuous rain. Their ration consisted of fresh beef, whole meal biscuits, bread, a vegetable ration, jam, sugar, salt, and tea. The total energy value was 3,465 calories, slightly less than the Atwater standard for moderate work, 1,000 less than for hard work and 750 less than is supplied convicts at hard labor. The health of the men was good throughout the experiment. For the last five days the average loss in the men was but ½ pound, and in officers ¾. It was calculated that men lost approximately 62 grams fat and 170 grams flesh during the last five days. (355)

From this experiment it was decided that 3,465 calories are not enough—that there should be from 4,500 to 5,000 for large men.

In the second experiment 20 men under command of one officer were used. By adding cheese and bacon to the ration, the number of calories was increased to 4,511. At the conclusion of the time, the men were in fine condition, not hungry, and had gained in weight.

From these facts, they infer that the field ration should give 4,500 calories, and hence be about 3 pounds.

The following ration (345) shows selection of part of the home British force:

Fresh or preserved meat.....1 lb.
Bread.....1 lb.
or biscuit ¾, or flour 1 lb.
Bacon.....2 oz.
Tea, ½ oz.; sugar, 2 oz.; salt, ½ oz.; mustard, 1/20 oz.; pepper, 1/36 oz.. In lieu of ¼ lb. of bread, may have 1 oz. cheese, 1 oz. jam, and cash allowance for food of 1½ d. per day.

Major Lelean reports that the field ration of 3,900 calories used by the British has been found insufficient and that they are now using 4,855. He states that where food value is too low, debility and neurasthenia results. He presents the following table for comparison:

		Calories	In Field	Reserve
Field ration of 1913 and now	French....	3,064	175 grams	180 grams Protein
	Russian....	4,890	218	80 Carbohydrates
	German...	2,801	515	326 Fat
	English....	4,855	4,855 calories	2,800 calories

He states that chocolate has proven thirst-provocative rather than quenching. (133, Ch. I)

All writers point out the necessity for variety.

In the use of tinned foods, demanded by the exigencies of war, extreme care should be used. The exterior of the can should be observed and labeled plainly with contents and date of canning. It should have not more than two solder holes, with its ends concave and giving forth a dull percussion. The presence of a small amount of gas can be detected by opening under water. Under no circumstances should the tin show erosion, nor should the solder project over the seams.

Excess in eating may lead to biliousness, forms of dyspepsia, and excessive waste. Excessive waste irritates the kidneys, and may cause gout, obesity, hardening of the arteries. Beefy men, over-fed, are subject to apoplexy.

Cooking of Foods. The soldier should be able to cook his own food. He should avoid fads and extreme Fletcherization. The cooking for the soldier is governed in general by the same principles as for the civilian; that is, variety and assimila-

bility should be considered. *Appetite juice* is a valuable asset in the diet. For this reason the mincing machine, kept thoroughly clean, has proven valuable in the present war. (133)

Keefer suggests as the general diet the following: Milk, eggs, and beef, the latter to be avoided when of dark purple color or odorous. It should not be excessively soft or sticky. Bacon and meat juices and powders (extracts) may be used. Under stress, horseflesh, dogs, and even rats, have been eaten. Flour bread is good but should be well prepared. Beans, rice, potatoes, sugar, fruits, tea, and coffee are included in his list. Cocoa might well be added. Of the various ways of preparing meat, he names the following which should be used in variation as much as possible: stewing, boiling, roasting, broiling, frying, broths, and soups. Vegetables should be cooked with care. In all cooking the temperature should be kept fairly low—170 deg. Fahr., except for the brief interval at the starting of the process. Infection should be prevented as typhoid, tuberculosis, tapeworm, trichinosis, glanders, and ptomaine-poisoning may result from infected food. Scurvy and beri-beri result from faulty diet. The former is due to lack of organic matter in the food. The latter is due to the loss through excessive milling of the vitamines contained in the outer layers of the rice. Scurvy may be alleviated by adding ½ ounce of lime juice to the food daily. Coarse milled rice will prevent beri-beri. (116, 133, Ch. I)

The problem of the transportation of food is a great one in the present war. It is for this reason that much of it has to be handled as canned goods. But the commissary departments have proved efficient and the extreme need of having *well-fed soldiers* has been recognized so thoroughly by the commanders that so far there is little complaint in this respect. Where the invading force attempts to subsist on the food of the conquered sections, still more care has to be exercised. But the present campaigns are on such a stupendous scale that little dependence can be placed on such food supplies.

Civilian Food in War-Time England. The matter of food supply is one of significance not only to the soldier but to

the civilian. All energies are bent toward the purposes of war. Hence any drain on forces which might be employed in its furtherance tend to defeat its end. The food of the country invaded must be conserved, not only for its soldiers but for all its inhabitants. The food in the country of the invader must be economized so that the savings thereby may be used in furtherance of invasion or conquest.

We can, therefore, easily understand the emphasis which Great Britain is putting upon this subject throughout the kingdom. Though a largely importing country and insular, she is able, through her navy and colonies, to obtain food. Yet this is at some risk, and every ship used for the protection of food supply means necessarily so much energy diverted from the conduct of war.

It has been pointed out by one writer that the prices indicate that England will not suffer for want of food for some time. But, nevertheless, it is necessary to practice 'national economy' and prevent 'individual hoarding'. He tells that at the beginning of the war the 'better-to-do people' carted off more food than they needed. But the government, with the assistance of the board of trade, put a stop to this and also succeeded, moderately well, in preventing unnecessary rise in price. He urges that the population must be conserved and that to do this housing and food must be looked after. It is essential that air, light, warmth, and food be provided. (340, 341, 342, 343)

In this plan of economy, it has been suggested that the consumer must be protected from short weight, etc. It was recommended that tea, coffee, powdered cocoa, should be sold by 'net weight'; that bread, except that known as 'fancy bread', should also be sold by exact weight. The quality of the flour used in making the bread should govern to some extent its price. Gluten gives elasticity to the flour. The presence of so-called 'improvers of flour' in the form of mineral phosphates increases the weight by increasing the amount of water absorbed without adding anything to the value of the bread. (343, 344)

Since part of the usual food supply will be limited owing to dangers and difficulties of importation, not to mention cost, it is necessary to form and find substitutes. It will be necessary to get all possible nourishment out of everything. Simplicity of diet with as much variety as possible is the watch word. No longer must the Englishman look with contempt upon hashes and stews. Owing to the large number of men away at the front, the harvest may be impaired. More bread, cheese, and butter should be used. One writer says, "It is of interest to add that in the great textile trades, big stocks of low-grade wheaten flours are kept, which are employed for sizing the fabrics in conjunction with the use of 'loading' materials; as, for example, china clay." At this critical time, this starch supply must be reserved for human food.

As the food most expensive and hardest to import contains the proteid element, it will be necessary to seek substitutes. Hence pulses, peas, lentils made into soups, puddings, etc., should be employed. Chestnuts, bananas, and maize should find wider use. To supply the deficit of butter the 'drippings' from meat should be saved and used. Fish, chiefly herring, kipper, and bloaters, must take the place of beef to a large extent. It is well known that the English civilian and soldier uses 'jam' and marmalade extensively. This furnishes part of the needed sugar supply. Pamphlets, circulars and lectures are being given throughout Great Britain on such topics as: 'Foods to Buy During the War', 'The Highest Nutritive Value at Lowest Cost', 'The Preservation of Food', etc. (347)

Germany's Food Supply in War Times. (226) Strauss claims that the peasants of Germany are better fed now than in peace times. Far more care has to be used in choice and preparation of food. He says the educated classes, so-called, do not need to be considered, as their number and condition is such that they are not obliged by prices to curtail their usual supply. They, in fact, do not seem to realize that importation is limited. He states that some of the sick should go on an anti-fat diet. For the diabetic, oils, nuts, and cheese will furnish the necessary fat. Protein may be obtained from smoked fish. He

urges the more extensive use of skim milk. Dispeptics may use potato flour cooked in skim milk. Rice, cocoa, and chocolate, he points out, are already becoming scarce in Germany.

Germany exports rye, and imports eggs, wheat, milk, and cream. This importation being very limited, it is necessary for each German to do without a small amount. It is suggested that the lack of 30,000 pounds of butter from Russia annually means but a slight deprivation on the part of each German. One of her writers states that owing to the war she is losing annually from importation:

from Argentina, America, and Australia . .	18,000 tons beef and mutton
from England	50,000 tons herring
from Russia, amount not known	legumes
from India	215,000 tons India rice
total loss from importation of	3,000,000 tons wheat
total loss from importation of	250,000 tons fat

This may be offset by retention of her own sugar, 600,000 tons.

He urges that Germany cease to distil potatoes, for this vegetable is the mainstay under the present circumstances. The troops should be more abstemious. There is a deficit in the amount of food present to feed cattle and swine, which will make some adjustment necessary in the raising of these. It is from six to eight million tons. (337)

Oppenheim writes that the number of cattle slaughtered (in Germany) should be proportioned to some extent to the amount of fodder available. He suggests that probably 10 per cent of the milk cows and 35 per cent of the swine will have to be killed. Fourteen per cent of the horses of the farmers have been commandeered for use of the army up to January, 1915. The places of these animals will have to be taken by oxen, in some cases by cows and motors. The motor plow will be used more than ever and alcohol will have to be used as a fuel. This will probably have to be obtained from the distillation of potatoes. He points out that a motor plow requires 300 kilos starch value per day and does the work of twenty-eight men. Twenty-eight oxen require

400 kilos and more human assistance than does the motor plow. (336)

A serious problem is that of securing proper fertilizers. Chile saltpeter is no longer available and the phosphates are lacking.

It is necessary to use every bit of wheat for bread, not for starch or alcohol.

Rubner presents the following data: (200)

CONSUMPTION OF MEAT FOR 1912

Germany	52.3 kilogram per head	Austria	29.0 kilogram per head
England	47.6 kilogram per head	Russia	21.8 kilogram per head
France	33.6 kilogram per head	Italy	10.4 kilogram per head

He suggests that while unable to get eggs, poultry, or fish from Russia, they can obtain the latter in large amounts from neutral countries. He thinks rye will make up for rice and wheat.

A more careful study of the care, preparation, and use of the potato should be made. The vast waste due to spring rot must be avoided. He states that only 28 per cent of the potato crop has been used for the table, 4.6 per cent has been distilled, and 50 per cent used for fodder. A wider use of potatoes should be made in soups, purees, etc.

It will be necessary in some way to make up for 3,500,000 tons of cheap fodder imported annually. He would maintain the stock of milk cows at all hazard. Let the people economize on butter. Should each German stint himself but *one gram* per day, it would release for other uses 300,000 milk cows.

From what has preceded it is easily seen that should Germany run short of food, it will be largely in those products furnishing the protein.

Salkowski estimates the per diem consumption of protein in Germany before the war as 92.9 grams of which 25 per cent was imported. If the German should depend upon his home market alone, he would have 67.2 grams. The amount neces-

sary is 64.6 grams. It is seen that if the country practices economy she can get along. In confirmation of this position he states: (204)

Chittenden places the minimum at 51 grams.
Pflüger, Bohland, Bleiblau, at 80 to 90 grams.
Hirschfeld, Hundhede experiments, at 25 to 44.36 grams.
Salkowski's experiments, at 42.41 grams.

The experiments with dogs seem to indicate that low protein diet results in sensitivity to tuberculosis and infectious diseases. The facts show that both low and high protein diet are bad. He states that 'war bread' is deficient in protein; that milk, skim milk, and cheese are rich in protein; that potatoes are poor in this element; and that legumes are rich in it. However, only part of the latter is available as there is from 30 to 40 per cent waste. This may be overcome by making flour from beans, peas, etc. The author claims the waste can thus be reduced to 12 per cent.

He would have the people use the blood of slaughtered animals on a far more extensive scale than hitherto. "The use of blood soup seasoned with vinegar (the blood cooked with dried fruit) could be made more general." "To prepare blood for food, take coagula produced by heating the dilute fluid, dehydrate with alcohol or ether, dry in the air, and grind into a fine powder."

Kloss states that resistance to disease is not merely a matter of germ infection but of general bodily tonus and that one of the most important factors in this is nourishment. He points out that the danger of infection during war time is especially great and therefore the food should be cooked wherever possible, not eaten raw. (123)

One of the most careful and thorough of German writers on the subject of the food supply of the German people is Dr. Paul Eltzbacker who alone and in collaboration with others has put forth the conditions to be met and suggestions for meeting them. We shall therefore present in outline, as extracted from one of his papers or pamphlets of some 200 pages, its content.

THE FOOD SUPPLY OF THE GERMAN PEOPLE

(53, 54, 55, 346)

Chapter I. The Problem of an Isolated Political Economy.

a. The starvation plan (as the Germans view the English blockade).

b. Germany a closed economic area.

c. The isolated political problem; *i.e.*, problem of political isolation is a new one.

Chapter II. The Reduction of the Food Supply.

1. Reduced imports—10,000,000 tons import of fodder for example, has ceased.
2. Home production of food stuffs:
   North Sea fisheries reduced to a minimum.
   Agriculture suffers from lack of laborers, horses, manures, etc.

Chapter III. The Food Requirements of the German People.

1. Aim of nutrition:
   1 gram of fat gives 9.3 calories.
   1 gram of carbohydrate gives 4.1 calories.
   proteid lacking.
2. Requirement in calories of German people per year proportionate to age, sex, work. About 56.75 billion calories needed.
3. Proteid requirement must be worked out separately.
   Voit held body of 70 kilos requires 105 grams of proteid daily.
   Neuman held (in 1902) body of 70 kilos requires 71 grams of proteid daily.
   Schumburg (1873) held body of 70 kilos requires 60 grams of proteid daily.
   Good average is 3,000 calories, total 70 grams of proteid daily. About 70 grams forms about 9.6 per cent of total food.

Chapter IV. The Actual Consumption of Food by the German People before the War.

1. Ascertain the quantity:
   The present rate of consumption would give 90.42 billion calories, totaling 2,307 thousand tons proteid.
   The actual physical requirements of 68 million people are 56.75 billion calories, totaling 1,605 thousand tons proteid.

The consumption exceeds actual needs 59 per cent.
Nutritive value 44 per cent proteid excess.
Annual home production (1912–1913) was 71.24 billion calories, that is, 1,636 thousand tons proteid.
Thus, if Germany continues at rate of consumption in vogue preceding war, she will show under such régime under war conditions a deficit of 25 per cent of total food stuffs and 33 per cent proteid.
While it is possible to have 19 per cent more than physical requirements, there will still be lack of 3 per cent proteid and this deficit will tend to increase.

2. Storage.
3. Adaptation of production:
   Use ground for most nutritive vegetables, beets, potatoes, etc.
   Put unused and unoccupied ground to use.
   Use different materials for fodder (potato tops have been suggested).
   Use every food as directly as possible for man and thus save.
4. Adaptation of habits of life.
5. Means of carrying out the necessary measures:
   a. New laws.
   b. Careful administration.
   c. Instructions of people through press, unions, agricultural societies, school, lectures, etc.
   May be necessary to fix prices by law.

Chapter VI. The Prohibition of Export.

1. Grain.
   Author says 2,500 wagons of grain which should have been kept at home were sent through mistake to Switzerland. (However, facts seem to show that this was already property of Swiss, merely in course of transit through Germany and in no proper sense a legitimate part of German food supply.)
   Denmark has prohibited export of barley to Germany.
2. Sugar.

Chapter VII. Agriculture.

1. Crops to be chosen.
   - In 1912–1913 Germany imported 251,000 tons of peas, 28,000 tons of lentils, 31,000 tons of beans, 2,000,000 tons of wheat. She exported 1,100,000 tons of beet sugar and 600,000 tons of rye.
   - Nature of exports suggests the growing of pulses, beet sugar, etc., to supply deficiency.
2. Seed corn.
3. Labor and traction.
   - They expect prisoners of war to supply part of labor; will have to break the colts to work earlier, use bulls and oxen, perhaps cows, to take place of 14 per cent horse deficit.
   - Use steam and motor plows and machinery where possible.
   - Use benzol instead of petrol oil.
   - Use coke instead of coal.
4. Manures.
   - Care must be exercised in storing, to keep out the air. It is claimed that the keeping up of the potato yield proportionate to the increase in population is due, 50 per cent, to artificial manures and 30 per cent to better selection of seed.
   - Conserve and use with judgment, nitrogen, phosphoric acid, potash, and chalk.
5. Culture of moors.
   - 20,000 sq. kilometers of usable land said to be idle in Germany.
   - Stretch of land on both sides of the Hamburg-Bremen railroad could be used.
   - Must have more intensive cultivation.

Chapter VIII. Live Stock.

1. There will have to be a reduction in the number of cows and pigs. In fact, there must be a general reduction in the number of beasts.
   - The government has forbidden the use of bread-corn as fodder; this amounts to 2,000,000 tons in rye alone, yearly.
   - Breeding will have to be limited.
     - 'The pig is greatest food competitor of man'. In feeding a pig weighing from 15 to 120 kilos, 24 per cent of proteid and 44 per cent of total food given to it are retained for man's use as food.

In calf of from 30 to 360 kilos, but 20 per cent proteid and 14 per cent total food value are thus retained. While in a milk cow weighing 500 kilos and giving 2,200 liters milk per year, 36 per cent of proteid and 24 per cent of total food fed are retained for man's use.

It is then seen that milk cows should be retained as much as possible.

2. Degree of limitation of number of beasts:

For every 3½ pigs destroyed one cow may be retained; that is, a reduction of 9,000,000 pigs should increase the number of cows retained by 4,000,000 or a reduction of 35 per cent of pigs result in 10 per cent increase of cows.

3. The carrying out of the reduction.

Slaughter poor-producing cows first, but gradually.

Retain pigs only so long as there is no other use for skim and butter milk.

4. Small live stock.

Poultry, etc. Not much to be expected here under war stress.

5. Increase production of fodder.

Leaves of beet and potato may be used; these should be harvested and preserved.

Much of the green stuff ordinarily plowed in may be used for fodder such as Chinese radish, white mustard, peas, etc.

Chapter IX. The Proper Utilization of Agricultural Products.

1. Corn and potatoes.

Beet parings are usable. Rice and maize no longer available. In 1911 34,000 tons of rice and 25,000 tons of maize were used. Must find substitutes for these. Should replace wheat starch with potato starch. Avoid use of starch on linen, etc. Limit the use of potatoes in the making of alcohol. Do not use grains for alcohol, *i. e.*, rye, wheat. Utilize every part of wheat and rye, bran, etc., in bread. Use potato in making potato bread.

Bread should contain a minimum of 10 per cent rye and 5 per cent potato. It is possible to dispense with yeast.

2. Vegetables and fruits.

Use edible fungi.

Storage, pickling, drying, preserving,—topics that should be studied.

3. Sugar.

Use it in preserving fruit.

Use surplus as fodder.

Use sugar in the form of molasses to make other materials palatable to beasts, *e. g.*, with beet parings.

For milk cows, per 1,000 kilos, it is advisable to use 10 kilos of beets; for cattle, per 1,000 kilos, 15 kilos of beets; for horses, per 1,000 kilos, 8 kilos of beets; for sheep, per 1,000 kilos, 25 kilos of beets; for pigs, per 1,000 kilos, 25 kilos of beets.

4. Milk.

"Full milk is to be retained in its present quantity, production of cream and butter is to be limited, cheese is to be produced where possible in increased quantity. From the skim milk remaining after making butter, cheese (curds and skim) is to be made as far as possible and the direct use of skim milk is also to be encouraged by propaganda and cheap prices."

5. Meat and fat.

Germany must reckon with the fact that pigs are to be reduced 1/3 and cows 1/10. This will temporarily increase amount of meat on market. Must slaughter and store carefully and properly.

The farmers should themselves prepare and smoke hams, bacon, etc.

Limit the use of fat for technical purposes as in soaps.

Chapter X. The Necessary Alteration in Habits of Life.

1. Must use more vegetable food.

Must use food materials *now* in abundance, *i. e.*, in excess.

Must limit proteid consumption, and diminish it.

Relative Consumption of Meat per Head:

Year	Kilos	Year	Kilos
1818	13.6	1883	29.3
1840	21.6	1892	32.5
1861	23.2	1900	43.4
1873	29.5	1907	46.2

The increased production of linseed oil, beechnuts, sunflower seeds, etc., may help a little. It has been suggested that the use of fat incites to the use of alcohol. Hence limitation of former tends to limit latter.

2. Meat, fish, milk, cheese, skim milk, pulses.
3. Bread, porridge, puddings, potatoes, vegetables.
4. Fruits, sugar.

"Exact investigations have shown that taking some 12 to 15 grams of sugar in half-hourly intervals can remove the sense of fatigue in very large measure."

Sugar does not produce thirst. Germans should use it more in tea and coffee.

5. Household Economy.

Substitute puddings for meat at the midday meal.

Do not eat between meals.

Marmalade may be used with profit instead of fat.

Do not use butter when you are eating ham and bacon.

Watch marketing. Avoid waste. Economize on soap, needing fat for other purposes. Watch home cooking.

For breakfast use rolls; for dinner large loose rye or rye and wheat flour; for supper the same.

Chapter XI. Results:

THE COVERING OF THE DEFICIT

Nutritive Value	Proteids in thousands of tons	Calories in milliards
Physiological requirements	1,605.0	57,750.0
Actual use before the war	2,307.0	90,420.0
Available if the present conditions remain unaltered	1,543.0	67,860.0
To add; through alteration of cattle keeping	217.3	2,878.0
through prohibition of corn as fodder	78.3	2,741.0
through avoidance of waste	80.0	5,675.0
through increased use of skim milk and skim cheese	48.8	250.9
through potato drying	18.9	1,112.3
through limitation of butter production	14.8	110.4
through cultivation of moors	10.4	592.0
through prohibition of production of alcohol from corn	4.7	68.6
through preserving vegetables	3.6	93.0
through preserving fruits	1.7	147.5
through prohibition of production of wheat starch	1.3	5.2
Subtract Sugar used as fodder (thousand)		283.1
AVAILABLE, if the means recommended are carried out	2,022.8	81,250.8

The author considers this estimate a most conservative one, based on the lowest figure, under highest expenditure and worst conditions. When it is borne in mind that the German army is away from home, on a foreign soil from which it draws a large part of its sustenance, the sick and children being counted as consuming the same as normal adults, it is easily inferred that the prospects of being able to take care of herself for some time are good in Germany.

In other articles, Dr. Eltzbacker has suggested changes in procedure which will help the Germans. He points out that

it is best to peel potatoes after cooking rather than before and to be careful in this process, for it is possible to avoid thereby an annual loss of one-half million tons. Germans should also use more sugar. He states that the consumption of this in the United States and England is twice that per head in Germany.

Schwalbe gives the following concrete suggestions to the German people as to their menus during war time: (210)

For their *first and second* breakfasts:

Rye bread eaten with jam or soft cheese. Omit meat.

Sweetened decoctions of oat meal or barley may be used as beverages and also to substitute in part for bread.

For their *mid-day meal:*

Soups, containing legumes, scraps of meat, and potato.

Wheat flour, porridge made with skim milk.

Potatoes, cabbage, beets, turnips, green beans, etc., may be cooked together with a little fat meat.

Sour kraut cooked with pea-porridge, white beans with prunes, potatoes with dried apples or prunes.

Noodles eaten with fruit jam, dumplings.

All kinds of cereals cooked in skim milk and highly sweetened.

Use cheaper fish, herring, etc.

Fruit stews, tomatoes, etc., as relishes.

For *supper:*

Rye bread and cheese form the staple food for this meal.

May use a little bacon or sausage after a meatless dinner.

Baked potatoes eaten in the skins, with herring or bacon instead of butter.

Children must, in general, eat largely of cereals cooked in skim milk.

Food and Fatigue. Jacobi has pointed out that there are two types of soldiers: those who work like demons and are considered heroes, and others who seem to let up and are called quitters. These same types exist in the civilian population. Upon examination it is often found that the second class are in many cases half-fed and tuberculous or otherwise diseased. He says " . . . exhaustion means more than a high degree of fatigue. A difference here obtains in regard to protein and carbohydrates, insufficiency in utilization. If ordinary energy-food (carbohydrates) is not available, the organism must draw upon protein-food and protein tissues

for energy supplies. This means exhaustion, structural and functional, and everything short of this situation may be conceived as some degree of simple fatigue." The author is at pains throughout to discriminate between the highest degrees of fatigue and exhaustion. The former appear to be associated with a particular condition of the circulation which in theory should respond to stimulation. The milder degrees of fatigue may be offset by the use of coffee, tea, cocoa, kola, etc. These stand in close relationship to the xanthin group. From another angle, the vascular indication may be filled by suprarenin and hypophysin. (105)

School Feeding. In Berlin since 1907, under the influence of the social democratic faction, school feeding has been common. It is, under the present stress, more than ever necessary to continue this. The authorities have provided that needy children shall be provided with a warm mid-day meal which may be procured from the Union for Folk Children's Kitchens. The city *charges* the Union 12 pf. for each portion. The granting of such free food is not considered charity. In one yearly statement, it was found that 22,000 marks had been thus expended.

In August 1913 128,434 warm mid-day meals were given needy children.
In August 1914 251,000 warm mid-day meals were given needy children.
In Sept. 1913 144,000 warm mid-day meals were given needy children.
In Sept. 1914 574,000 warm mid-day meals were given needy children.

HERE ARE SOME SUGGESTED MENUS FOR CHILDREN

For *breakfast:*

Use more rye bread than customary.
Vary by having a little wheat (white) bread.
Some butter, lard, use more marmalade, less sausage and more cheese.
It is unnecessary to have meat for breakfast.
Coffee, tea, cocoa, with abundance of sugar.

Mid-day meal:

Cabbage or potato soup with a little flesh or sausage.
Grunkern, barley, pea, bean, lentil soup, all mixed with potato.

Meal soup with skim milk, bread soup with apples, butter-milk soup.

Cabbage, beets, sugar beets with much potato and little fatty flesh.

Sour kraut with pea broth.

Sour lentils with beans and plums thoroughly cooked together (dried plums).

Potatoes with dried plums or apples.

Dumplings.

Flesh as hitherto but not daily. Limit its use to the growing children.

Herring, dried cod, and other kinds of fish.

Noodles with kraut or marmalade.

Mehlspeisen made of meal, potatoes, grits, rice mixed with little egg and plenty of sugar or skim milk. Complete this with cooked plums or apples, plum marmalade, tomatoes, or berry juice.

Alternate the meat and meatless days, using more meat on cold days. On the fleshless days use legumes or vegetables with skim milk. May use beer soup with bread or meal.

For *supper:*

After a fleshless dinner, use rye bread with curd or other cheese, bacon, sausage or other meat. Warm the food left from dinner or prepared warm meal. Potatoes (peeling on), with bacon or herring.

Dumplings, meal pudding with sugar and skim milk.

After a flesh dinner, use more sugar; after a meatless dinner, use more salty food.

For children there should be numerous broths of meal, grits, rice, millet, buckwheat prepared with milk. (252)

Objections to War Bread. As pointed out, the failure of Germany in the importation of wheat has forced upon her the necessity of substitution. For these, she has used rye and potato flour to a large extent. Objections have arisen in some quarters to the exclusive use of these. Michaelis condemns rye-flour-potato bread outright. Fürginer believes that wheat and rye do not give as good a combination as wheat and potato flour. Boas thinks that the digestive troubles attributed to the use of this diet are due as much to the nature of army life as to war bread. Loeb found that the chyme from army bread is more lumpy and frothy than normal. (338, 339)

But the complaints have been comparatively few. The bakeries have been seeking to make this rye bread digestible and palatable.

It has been claimed that the rye bread tends to:

1. Set up diarrhœa, a result of fermentation persisting in feces, due to some extent to bolting of food. May remedy this by eating less food and thoroughly masticating what is eaten.

2. Set up hyperacidity. The unusual pabulum acts upon the sensitive stomach causing it to secrete acid content to excess. It is impossible to do away with this as the stomach will not become adapted. Bicarbonate of soda in small doses will help.

3. Cause flatulence. This is the commonest ailment from eating this bread. Contrary to the views of some, it is not due to mass suggestion. As the soldiers were accustomed to fine wheat flour which they do not have to chew much, they fail to chew rye bread thoroughly, especially when it is fresh. The chyme containing particles of bread is then in such shape that it can not be dealt with by the pancreatic amylose. These particles of bread become seats of flora cultures in the intestines, while the cellulose present ferments. Blood charcoal in large doses is good for this.

4. Constipation. This is rarely found and is perhaps in most cases due to other factors. This should be treated by giving 'feces formers'.

The war will serve to teach us the proper foods to use, bring out types neglected hitherto, give lessons in preparation, care, preservation and economy. Most of these facts have been more or less worked out in times of peace. Experimentation under the stress of war, that is, the use of the 'trial and error method', is dangerous and may result in disaster. Should a large portion of army biscuits be poorly packed, improperly cooked, or infected, the injury may spell the defeat of the troops at the front. But of no less significance is the effect of such experiments at home. A supply of food spoiled through any of the factors suggested, means an extra tax on the home folk, one that they may be utterly unable to meet.

Carefully as the scientific men of Germany and England have worked out the methods of meeting the conditions facing them, it will be impossible for the entire nation to change

the habits of centuries within the brief space of time necessary, hard as they may try and sincere as they may be in their efforts to so do. Far better, far surer, is the gradual habituation of the people to such useful habits. This is possible only in years of peace. A glance at the enormous increase in the number of children it is necessary for the city of Berlin to feed will indicate how stupendous the problem of proper feeding, not to mention food supply, may become and how utterly impossible, under such exigencies, is proper training. (68, 358)

Facts Showing Stupendous Task in Feeding Imposed by War. To those who are opposed to the methods of propaganda, the strenuous efforts made by military men and civilians in publications, leaflets, lectures, illustrated and otherwise, to instruct the people and arouse them to the necessity of observing hygienic laws, of eating proper food, of economizing, etc., must be rather disquieting. For the authorities expect this training to function and it apparently has.

Leaflets, Lectures, etc. Germany and England are issuing leaflets, scattered through the schools and given to the general public, bearing on such topics as 'What Food to Buy', 'How to Live Cheaply', 'Care of Food', 'How to Get Rid of Vermin', 'Typhoid', etc.

As another example may be mentioned the Chadwick Lectures on 'War and Diseases'. One of these dealt with development of military hygiene, another on the South African and the Russo-Japanese campaigns. Such are being distributed throughout Great Britain. (205)

As indicative of what is being done in Germany, we present the essence of an article by G. Gohde on 'Course of Instruction for Public Speakers on Nourishment of the People During War'. (68)

England having shut Germany off from outside food supply, it behooves the people of the latter to be economical; for every bite they conserve is a shot at England. To meet the need for proper instruction in economy, lecture courses have been established. Through these it is hoped to tell the people what to eat and how to conserve.

It is pointed out that "No one needs to hunger but each must economize. Then we shall have enough to live on—even through a long war." "Upon the participants of the course, whom the minister designates the home-army, falls the problem and truly they will at the end of the happy and victorious conclusion be able to say that they have contributed to the victory of the great national cause."

It will be necessary to watch and regulate farm production and especially animal production and use. It will be necessary to take extreme care of the milk cows and calves, for the future generation must be assured for all animals.

The first lecture dealt with 'The Real War Conditions', the second, 'The Nourishment of Man', and the third, 'What We Have and What We Lack'.

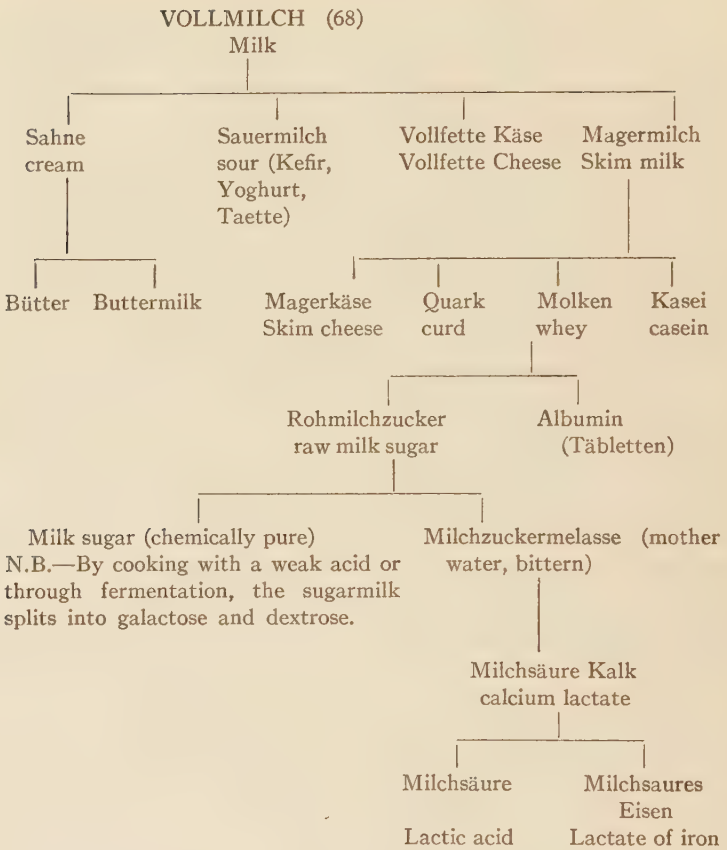
The average consumption for the last two years of peace per head has been 210 grams of wheat, 175 grams of rye, 40 grams of other grains, a total of 425 grams of which 35 grams were imported. Germany now lacks barley and rice. She will have to depend mostly upon potatoes and be more careful in their use. It will be necessary to follow a more strictly vegetable diet.

Of 150 grams of meat and fat used daily per head 15 grams were imported Germans used daily in the last two years of peace per head:

350 grams full milk
70 grams skim milk
10 grams buttermilk
50 grams goat's milk
20 grams butter
12 grams cheese

Probably 26 per cent of albuminous material, 42 per cent of fat foods, 8 per cent of carbohydrates and 20 per cent of general calories, were imported. Thus she is cut off from about one-fifth of her food supply. But if the people at home will hold themselves to the same strict discipline as the army in the field, the country will come through all right.

In the second session, the first lecture dealt with the 'Protection Against Losses'.



The lecturer pointed out that it was necessary to cease all exports of food stuffs. Through friendly consideration toward the Swiss, 2,500 wagons of grain had been exported to them. But this was hardly advisable, for no political considerations can substitute for the means of subsistence. Sugar should by no means be exported. More care should be exercised in transportation and sale of products in order to diminish losses due to these factors. In this connection may be mentioned the slaughter of hogs which give only 24 per cent albuminous food as contrasted with the 20 per cent from cattle and 35

per cent from milk cows. It will also be necessary to limit the schnapps and beer production. Germany has up to now manufactured 16 mill. dz. of barley into a value of 316 mill. Marks in beer and 27 mill. dz. of potatoes into spirits. Extravagance in the home and in the feeding of brutes must be avoided. Whoever consumes spirits is destroying the means of human subsistence. Less animal and more plant food must be used. "Each must set a good example if we would lead the German people not only to a military victory but to a real true victory."

The second lecture of this session dealt with 'The Significance of Plant and Animal Production for Our Nourishment'. The lecturer dealt with the effects of the incoming harvest, and how it would tend to supply the food needs of the people. One of the important phases, he declared, is the feeding of animals and plants themselves. Animal metabolism is promoted by the employment of organic substances while the plant depends upon minerals. The lecturer therefore demanded "the general introduction of the 'tonnen-systems' in the homes during war times."

Another lecturer dealt with the topic 'Concerning the Significance of Fruit and the Cultivation of Vegetables'. He stated that Germany has been importing some 200,000,000 marks' worth of these. By themselves cultivating small spaces, it is possible to help much in this respect. Marmalades are good and should be kept in the home especially for children. Material was then suggested for an 'Anschauungskursus'.

A series of agricultural subjects was also given. Here are some of the titles, 'Manuring of Plants with Special Reference to Nitrogen', 'Animal Nourishment and Feeding', 'How Must the Arrangement and Conduct of Agricultural Management be Changed in War?'

Special courses were given through expert dairy farmers, millers, slaughter-house men, and through bakeries. All the participants were on one day taken on a tour of inspection and observation. Explicit precautions to be taken with cows

used to supply milk to children were shown. Suitable cows, selected by the director himself, inspected by the veterinary as to the exact state of their health, were kept in observation under quarantine for a week. They found extreme cleanliness in well-aired stalls. Feeding of the stock (cows) is according to police regulation and is exclusively dry feeding. The milk of each cow as drawn was tested in the laboratory. Monthly bacteriological tests were made at the proper institutes. The milk was filtered and placed in cold storage (Kühlhalle). Here it was further purified and run through a 'Wattefilter'; then it was rapidly cooled and placed in absolutely pure cans. This milk can be turned out in 'unthinkably' pure condition. The price per litre is 60 pf.; for pasteurized 50 pf.; and for sterilized child's milk 80 pf.

In the third session a lecture was given on 'War Bread'. The following suggestions were made:

1. Control your desires; avoid those things which are only for color and appetite.
2. Buy fat meat.
3. Use our stock animal food rationally.
4. Cook a mixed diet.
5. Use meat properly (hogs' heads, beef lungs, small pieces of meats, snouts, paws, beef hearts, kidneys, etc.).
6. Learn to refine the taste of our time.
7. Store away only those things for which good space can be profitably used.

In a lecture on 'How to Economize' the following was put forth:

1. Economize through immediate care in use.
2. Through better employment of present grain stock.
3. Through the consumption of extras of bread making.

Eat 'war bread' but chew it well. Those afraid of their digestion should bear this in mind. Especially in the evening, eat cheese and smoked fish accompanied by sweetened tea, coffee with honey or fruit marmalade. Use the 'war bread' preferably for nervous digestion.

Other lectures were given on 'War Cooking', 'Reasonable Attitude', 'Means and Ways for the Instruction of Women', 'Retrospect and the Future'.

It was urged that the German people eat too much; that they should stop eating between meals; that they employ everything from the kitchen to support animals. (For example, one hotel obtained 8,000 marks yearly for its refuse. In one week from 12,000 houses 50,000 kilograms of food-stuffs were collected. In Stuttgart it was found that there was a waste of 8 per cent in bread among the lowest class and of 2.5 per cent among the middle class.)

30 per cent of the potato is lost in peeling.
1 kilogram of poorly peeled potatoes gives.....700 grams
1 kilogram of well peeled potatoes gives.....740 grams
1 kilogram of baked potatoes (with jackets on) gives..960 grams

Skim milk is cheap, contains much albumen, and is easily digested because it is without fat. It is especially good for children. When cooked it tastes little different from real milk.

Another lecturer urged the women of Germany to awake. They must not rely on the lore of their grandmothers. They must learn the true conditions and how to meet them. They must think nationally, not individually. The housewife does not realize that the saving of but one gram per day, or perhaps two grams, by each person amounts in the course of a year among the whole people to 12,000 tons. Two grams of bread saved daily in 10,000,000 households amounts to 20,000 kilograms or 10,000 four-pound loaves. (More figures and illustrations of this type were given.)

The Buyers' Union should be consulted and properly run. Prices should be published. They should set forth the best foods for the price, etc. Eating houses should be controlled, etc. They should hold special assemblies for cooks, servants, waiters, etc. They might issue receipts for cooking, etc. It would be well to erect muster-kitchens in large cities in which women might get practical experience. They should urge the stewing of small pieces of meat. Cook the small pieces in a hot pan without fat and roast the larger pieces. As appetizers and taste promoters, eggs are valuable. They serve as a full nourishment for the sick. Their food value has been some-

what overestimated. Use bone soup made by cooking for 9 hours (three times for 3 hours each to get lime content in proper shape). Use rabbits. These increase rapidly. They have been neglected as a source of nourishment. Fish, especially dried cod, should be eaten. Here and there chickens must be used more than formerly, because of the growing lack of corn. Ground bones, mussel shells, and practical hen houses should be provided. In the spring they may be fed upon insects—in harvest on grain and berries. They should be turned loose in the forest. Germans should limit the use of butter, using margarine and the like where possible.

For fertilizers, use everything available, sweepings, lime, coal dust, soap water, soot from the chimneys, sand from canary bird cages, dove, chicken, and dog stall droppings, ashes and latrines if possible. Beans, lentils, and peas must be raised extensively. Use them green. Dry them for winter use. The fruits and plants of the forest are to be gathered and used in many places, as also the unripe fruits. Fallen, plucked berries, through good sterilization and care offer a store for rich satisfaction in summer. Wise action will enable the wife to give a great variety.

Another lecture some 2½ hours long was given on 'Materials for Dissemination by Wandering Lecturers'.

This course we have been describing was given to those who were expected to do a species of University Extension work along these lines, such work as our agricultural colleges have done with corn, wheat, etc.

We have already called attention to the effect which war has on those at home, the non-combatants—an effect rarely enumerated and at this time not capable of being ascertained with exactitude, as the Commission points out. Not only are there deleterious physical, economic, and moral effects, but the morale of those at home is affected. Outrages are justified by all parties on the mere basis of the exigencies of war, war reprisals, vengeance, or necessity. This has been amply illustrated in the present European conflict. All law is laid aside. Each combatant claims the right to make law, not

only with reference to the combatants but also to the innocent bystanders. The Balkan Commission found

> Every clause in international law relative to war on land and to the treatment of the wounded, has been violated by *all* the belligerents, including the Roumanian army, which was not, properly speaking, belligerent. (194, p. 13)

The same statement bids fair to be true in the present war. As for the domestic affairs of the countries involved, their energies being devoted to unproductive labor, there is a lack of balance in the economic and industrial world. Refugees rush from one part of the land to another, carrying their wants, their waste and diseases with them.

EFFECTS UPON MORALE AND MORALS

The Non-Combatants in Balkan Wars. To give a full description of all the horrors suffered by the city of Adrianople and its environs, as it passed through the hands of the various victorious armies, is not possible here. After itemizing the losses of a family considered typical, the investigators believe that

> From the losses here sustained by a single family, father and two sons, amounting to fr. 19,500 (and the prices are not overstated, so we are assured by the inhabitants of Vidine), some idea may be formed of the enormous figures of the estimated cost of the Balkan wars to the inhabitants. The loss caused the Servian peasants by the Bulgarian invasions of Knjazevac is rated in the document we publish at fr. 25,000,000 or 30,000,000. No one, as far as we are aware, has tried to estimate the loss caused the Bulgarian peasants at Belogradthik and Vidine by the Servian invasion. (194, p. 140)

We have already mentioned the refugees and the enforced emigration. But the following will give a more vivid idea of the significance of the above.

> While the 80,000 Bulgarian refugees are addressing their supplications to Sir Edward Grey, the telegraphic agency at Athens informs us that 100,000 others, Greeks by nationality, are fleeing from the Bulgarian administration. Exact statistics are not available, and we are aware that reliance can not be placed on figures given at popular meetings or official agencies. Nevertheless, it may be believed that we are not dealing here with isolated cases, but with a real exodus—a portion of the picture to be seen throughout the Balkans. The Turks are fleeing before the Christians, the Bulgar-

ians before the Greeks and the Turks, the Greeks and Turks before the Bulgarians, the Albanians before the Servians; and if emigration is not so general between the Servians and the Bulgarians, the reason is that the two nations have not, so to speak, encountered on their own soil, while that soil coveted by each, namely Macedonia, they regarded as already peopled by men of their own race. (194, pp. 154–155)

The whole series of events in the Balkans serves to emphasize

That legitimate national sentiment which inspires acts of heroism, and the perverted and chauvinistic nationalism which leads to crime are but two closely related states of the collective mind. Perhaps indeed the state of mind is the same, its social value varying with the object to which it is directed. We regard as legitimate, we admire the deeds, the manifestations by which nationality defends its existence. We speak constantly of the 'good cause' of oppressed nationalities struggling against difficulties to find themselves. But when these same nationalities pass from the defensive to the offensive, and instead of securing their own existence, begin to impinge on the existence of another national individuality, they are doing something illicit, even criminal. In such a case, we have seen the theory of state interests and the state feeling or instinct is invoked. But the state itself must learn to conform to the principle of moral freedom of modern nationalities, as it has learned to accept that of individual freedom. (194, p. 206)

In closing the chapter on the 'War and the Non-Combatant Population' the Commission states:

. . . We desire to remind the reader that it presents only a partial and abstract picture of the war. It brings together in a continuous perspective the sufferings of the non-combatant populations of Macedonia and Thrace at the hands of the armies flushed with victory or embittered with defeat. To base upon it any moral judgment would be to show an uncritical and unhistorical spirit. An estimate of the moral qualities of the Balkan peoples under the strain of war must also take account of their courage, endurance, and devotion, If a heightened national sentiment helps to explain these excesses, it also inspired the bravery that won victory and the steadiness that sustained defeat. The moralist who seeks to understand the brutality to which these pages bear witness, must reflect that all the Balkan races have grown up amid Turkish models of warfare. Folk-songs, history, and oral tradition in the Balkans uniformly speak of war as a process which includes rape and pillage, devastation and massacre. In Macedonia all this was not a distant memory but a recent experience. The new and modern feature of these wars was that for the first time in Balkan annals an effort, however imperfect, was made by some of the com-

batants and by some of the civil officials to respect a European ideal of humanity. The only moral which we should draw from these events is that war under exceptional conditions produced something worse than its normal results. The extreme barbarity of some episodes was a local circumstance which has its root in Balkan history. *But the main fact is that war suspended the restraints of civil life, inflamed the passions that slumber in times of peace, destroyed the natural kindliness between neighbors and set in its place the will to injure. That is everywhere the essence of war.* (Italics author's.) (*194, p. 108*)

The Inadequacy of War as a Promoter of Ethics. Statistics, such as are available, refer for the most part to losses of the army and navy itself and hence do but scant justice to a total estimate of the full effect upon the whole population of a country. We have already pointed out the inherent difficulties in the way of obtaining exact data relative to past wars, difficulties which may arise in the present. But such facts as are available have warranted a positive conclusion as to the evil influence of war upon the morals and heredity of the nations. In our first table we have shown the losses due to some of the great wars. But these do not reveal the number of widows, of orphans, of cripples—an increased tax upon the state—nor of women capable of mating deprived of fitting mates. We have quoted at length from the Balkan report the facts which show the similar disgenic and unmoral effects of present wars. We have presented facts showing the spread of diseases due to occupation of territory by infected troops—diseases of such a nature that they impair the germ plasm itself, thus affecting the entire population. We have shown that such economic and social adjustments are forced upon the people that it is impossible during war times and for some time after their close to provide proper environment for the complete development of the capabilities of heredity. (See section on Food.) We have pointed out the various diseases which were already getting a foothold in new territories, largely European. Since writing that section, the various nations of the Balkans have become more largely involved and with them will enter, more and more, the diseases mentioned.

While, as we have shown in several places, modern war tends to confine its actual results to the battlefield—that is, more deaths occur in actual battle and fewer from wounds and disease owing to the development of hygiene in times of peace—that fact offers little comfort when we scan the enormous fatalities of present struggles.

During war all agencies are occupied in its pursuit. Schools are often suspended (Balkan report p. 268), the curriculum interferred with, medical inspection of them given up (see Introduction), children occupied in war business, school plants even taken for hospital purposes, municipal sanitation, milk supply, etc., neglected. This affects adversely the babes and the mothers as well as the older children. There is no time to provide adequate open-air schools, forest schools, lunches, etc., even if there were means and people to operate them.

Baginsky does well to urge that the war theme be kept out of the schools so far as possible because of its effect upon the tender nervous systems of the young. But his admonition can be of but little avail when everything is war, war from morning till morning again. When soldiers lie wounded, they must be nursed, no matter what the need of the children at home. Such is the condition in Germany and Servia to-day.

In war the moral ever gives way to the expedient. The present struggle gives ample evidence of this. Submarine warfare in which, to date, the principal sufferers have not been warriors but innocent non-combatants, the Zeppelin raids, the firing on unarmed vessels with and without warning, the use of deadly chemicals, all testify to the doctrine of might making right.

That countless atrocities have been committed even in the present war, facts seem to leave little room to doubt. Men cannot see, and cannot do these things without being affected thereby and that adversely. While it might have been claimed that the Balkan wars in their atrocities—rape of women and girls, brutal destruction of children, mutilations, etc.—were, owing to circumstances peculiar to those peoples, not typical of usual wars, the facts of former struggles and of the present

war furnish almost indisputable evidence to the contrary. And it should be borne in mind that the Balkan nations are involved now.

The Balkan Commission has well said, "Widespread and almost universal maltreatment of women and girls by the soldiers of the three nations has left behind moral consequences which cannot be overestimated." (194, p. 267) And again, "It is to be feared that many a young man learned for the first time to commit acts of violence and crime not permitted in civilized warfare." We might add that, judging from the facts of the present war, there probably is no such thing as 'civilized warfare'.

Living, breathing, thinking, this atmosphere of hate, rapine, vengeance, there must follow a psychological reflex whose moral tone is conducive to the lowest standards—decidedly immoral.

No one has ever judged that the life of the soldier in time of peace is conducive to highest morals. Only where he has sufficient work to keep him busy is it possible for him to control the human passion. A large standing army, except in time of war, is necessarily idle much of the time. The result of this is the same whether in soldier or in civilian—a letting down of the inhibition necessary to the best interests of society. A community is inclined to suffer morally from the presence of idle troops no matter how fine a body of men these may have been in their private lives, outside of the army.

V. THE ELIMINATION OF THE MOST FIT

RECRUITS

Type of Men Selected. In ancient times, it was thought that any man was fit material for a soldier, regardless of age, condition, or physical fitness. An opinion quite current is that young men make the best soldiers. It is also held by many that the well-built, well-muscled man makes a good soldier. The first idea has been utterly discarded, the second has proved untrue, and the third is true only under certain limitations. "A soldier is a machine of two parts, legs and arms offensive, chest and abdomen vital." It is, therefore, essential that he be fit *physically* and *psychologically*. (259, 260)

Regular army men of the old school, men who did not comprehend the importance of the medical corps or of psychical factors, erred in their evaluation of the soldiers of the regular army and of the volunteers. They failed to realize that the *quality* of the recruit varies inversely as the conditions of labor at the time of his enlistment. They did not give sufficient value to the influence of ideals in the training and conduct of the two types. They failed to remember that as a rule the volunteer represents a far more ambitious, energetic, and resourceful man than the regular army man.

The facts show that a most careful selection must be made. Each recruit costs Great Britain about $486 for the first three months. Should he prove unfit, this means loss of money, time, and energy. For this selection, there is need of special trained officers. In the United States the recruiting officer selects one out of every three or four applicants. Those selected are then passed upon by the medical examiner. In England the recruiting officer has been passing upon the physical characteristics of the volunteer and the combatant-officer has had to take care of the psychical condition of the

men. Sir Thomas Oliver states that poor medical examination of recruits has already cost the country £2,000,000. (165, 400)

He also points out that modern warfare has so changed conditions, that it is unnecessary for all the men to have perfect vision, perfect physique. Sappers, trench-diggers, etc., are quite as essential to the success of the army as men who can see to shoot, etc.

It is reported that the general physique of the volunteers in England and her colonies is quite high. (246, 399)

That there would be errors in the acceptance of recruits at such a time of stress is to be expected. Especially when one considers that from a normal annual enlistment of 35,000 the number mounted to between 250,000 and 300,000 for one month in England alone.

In the light of such facts as pointed out by Sir Oliver, the War Department of Great Britain has seen fit to make the requirements for enlistment less stringent than at the outset of the war. (401)

In the selection of men, it is well to consider their previous training. One author points out that for immediate service, city-bred volunteers may prove more efficient than country bred, though in case of prolonged struggle, the latter will prove superior. This he thinks due to the fact that the open air, regular meals, routine, sleep, etc., of camp act as a tonic for the irregular city man. The countryman is already used to such habits but not having been exposed to the infections of city life is liable to suffer severely from infectious diseases and the monotony of camp life. (116, 133, 259).

Also the previous employment of the men should be considered. Men who have engaged in very laborious work age more rapidly, their muscles become firmly set earlier and hence they lack adaptability. Thirty per cent of the rejections at Tyneside, England, were for this reason. On the other hand, such men are inclined to be steady and to act as a fine balancing force upon the younger men of the company. For such reason, clerks, teachers, and those engaged in similar occupa-

tions may be accepted at an older age than miners, section men, etc. (165, 399)

Sir Oliver points out that the previous occupation of the men may even prove a positive factor for good in their army work. Miners make superior trench-diggers—carpenters, joiners, builders excel in preparing grounds for camps and buildings, etc. He shows that military training finds the weak spot of the body. For example, the knees of the miner are stiff from his constant bending, and after some time in the service he is apt to develop nystagmus and be most effective in seeing in twilight vision. Among those enlisting from the Northumberland district, albuminuria was found in a small per cent of apparently healthy recruits after hard work. They found not over from 1 to 2 per cent of venereal disease among those from Tyneside. The amount of crime was small. While typhoid vaccination was voluntary, there was no trouble in getting the men to submit to it.

The principal defects found among men who apply for enlistment in the armies of the various nations are, venereal diseases, heart abnormalities, defective vision or hearing, foot deformities, and poor physique. While the recruiting officer cannot get at the internal diseases easily, he can pick out the following: deformities, inebriety, flat foot, piles, skin eruptions, lice, stiff joints, varicose veins, pallor, rupture, dirty, indecent tattooing, emaciation, defective development of parts, etc. (116, Ch. II)

Age. In 1798, the 68th Bombay Regiment, composed chiefly of *boys*, lost nearly half its number from sickness and could not be transported. While the 61st Regiment, composed of 900 *old* soldiers, was on board ship for 16 weeks and landed with but one man sick.

In the Peninsular War, 300 *five-year* men (1805–14) were considered superior to 1,000 lad recruits. (259, Ch. I)

Officers in the Mexican War report that the young men suffered most.

Lord Raglan found that young recruits were unable to stand the campaigns of the Crimean War. General Roberts

likewise found that his youth succumbed in the march from Cabul to Candahar. The surgeon general's report of 1885 shows that up to the age of 25, the rate of sickness in peace times proved very much above the mean for the whole army. The most effective armies have been those whose age was not less than 22 years. Physical maturity is reached between 23 and 25 years. (259, 260)

Woodhull states that the epiphyseal plates, especially of the sacrum do not reach their complete development till about the 26th to the 30th year. As the bones of the back are not mature and as it is the 'hollow of the back' which receives strain, it is here that fatigue is liable to be most felt. Since the sacrum and hip bones form the means of support for the weight of the soldier, they need to be fully developed.

Likewise any pressure placed upon the undeveloped chest, is liable to cause serious displacement of lungs and heart. Such pressure is exerted by the equipment that the soldier must carry. The postures which he must assume are also liable to interfere with normal development. It is during pubertal years that the heart increases most in size. The relative capacity of the sides of the heart changes, the ratio at birth being right side to left as 1 : 1½—at the age of 30, as 3 : 1.

So far as possible the individual and not iron-clad rules should be considered in enlisting. Factors we have previously mentioned should also be considered. The first call for 100,000 volunteers in Great Britain gave the age requirements, for privates, 19 to 30 years, and for ex-soldiers 42 years. The next call gave the age requirements for privates 19 to 35, and for non-commissioned officers up to 45 years. (399)

In the United States, the minimum age for enlistment is 16 for musicians, 18 for all other branches of the service. The maximum age for cavalry is 30 years; for all other branches it is 35. (259, 260)

Height, Weight, Chest, Measurement, Deformities. As more or less typical of the requirements of most armies, those of the United States may be given. The minimum height for

all branches of the service is five feet four inches. The maximum height for cavalry is five feet ten. The maximum weight for cavalry is 165 pounds and for other branches 190 pounds; the minimum is 128 pounds. Two general rules may be followed in regard to weight: 1. Multiply the height expressed in inches by two; multiply the difference between five feet seven inches and the recruit's height by two; add these products for the weight; or 2. The average weight should be two pounds to the inch up to five feet seven inches; add seven pounds for each inch in excess of this.

Chest capacity is determined by measurement and chest mobility. The measurements are taken at forced inspiration and expiration, the latter being the more important. Mobility is the difference between the extremes. The nipple circumference should be about one-half the height. A man of five feet six inches should inspire from 174 to 262 inches. A barrel-shaped chest is the best. Persons from five feet four to five feet seven inches should measure thirty-four inches and have a minimum mobility of two inches and a minimum expiration measurement of thirty-two inches. For those above five feet seven inches, the mobility should be 2½ inches and ½ inch should be added for every inch above that height.

Minor deformities which do not interfere with proper organic functioning may be ignored. But any defect which is at all liable to impair the efficiency of the soldier must be seriously considered.

To some these requirements may seem most arbitrary but they are not—being based on the actual requirements for the mechanics of war. It must be remembered that the soldier marches and carries his equipment. This requires a regular uniform stride and sufficient strength to carry the load imposed. As the average stride is about six-sevenths the length of the leg, it is necessary to have all the men approximately the same height since they must proceed together. Furthermore, as they profit much by the use of rhythm in marching, there is all the more need for uniformity of pace. A march of 15 miles up and down hills, carrying an equipment

of fifty pounds, means the performance of 350 foot tons of work. To do this, requires a certain minimum weight in the soldier.

Our ordinary army pace is thirty inches at the rate of 90 per minute; quick time is 120 per minute and gives about 3 2-5 miles per hour; double time is 180 thirty-five-inch paces per minute and gives about 6 miles per hour. It is used in rushes and is very exhaustive. Twenty minutes of such practice is enough. The German step is thirty-two inches at the rate of 114 per minute and gives about 3.5 miles per hour. Their attack rate is 120. This step seems too long. The English quick time rate is the same as ours. Their double time is a 33-inch pace at the rate of 175 to the minute. From these numbers, it will be seen that height and weight are important items. (43)

When the chest is considered as the receptacle of the lungs and heart, the significance of its being well developed is easily understood. The lungs not only supply the air which oxygenates the blood, purifying it and also liberating heat through oxidation, but this same air also helps to maintain the normal temperature of the body, especially during periods of marching, etc., by helping to prevent the raising of the normal temperature to the danger point.

General Health. The recruiting officer should examine the pulse. If it drops a beat the applicant should be rejected. Likewise the eyes and ears should be tested. As we have before mentioned, one should note the nature of the defect and consider it carefully before rejecting the recruit, who, though he may not be able to be a sharpshooter, may make an excellent trench-man, cook, etc. In general, the soldier should be able to hear ordinary conversation at a distance of fifty feet. Arterio-sclerosis and rheumatism justify rejection. (400)

"A tolerably just proportion between the different parts of the trunk and members, a well-shaped head, thick hair, countenance expressive of health, with lively eye, skin not too white, lips red, teeth white and in good condition, voice

strong, skin firm, chest well formed, belly lank, organs of generation well developed, limbs muscular, feet arched and of moderate length, hands large," are characteristics of a good soldier. (259, 260)

Men likely to be intemperate should be rejected as should those with flatfootedness. Recent inflamed large bunions should cause rejection. The head should be examined for abnormalities. The soldier should have at least intelligence sufficient to understand the modern weapons. The thumb and forefinger of the trigger hand should be sound. Hernia should cause rejection. The testicles should be handled and if sensitive or dwindled, the man should be rejected.

Rejection should also follow the finding of enlarged veins of ankle, behind the knee or on the thigh. Observe how nearly symmetrical is the action of applicant as well as his perspiration.

Habits. So far as possible careful inquiry should be made into the habits of the recruit. If they are of the drug type, in general it is best to reject. Owing to the stress of war, in parts of France the drug supply has been so diminished that some have been forced into abstinence. In some cases this seems to have done them good and helped them break the habit. However, the lack of their toddy, opium, etc., may in some cases, render them unfit for service, and make them a tax on the already burdened medical corps. Of tobacco and alcohol we shall have more to say later. (376)

These facts show that all these conditions and requirements of a good recruit and good soldier are the product of peace and are such as many of our businesses and occupations demand. The study of efficiency has shown how necessary it is that these same elements be considered in the selection of workmen and in their work.

Teeth—Importance. All those reasons which exist for the proper care of the teeth among civilians, hold for the soldier and this in addition: that, since the food which he eats is limited in variety and is generally of a hard texture, sound teeth are absolutely necessary for good digestion and health.

One writer (412) claims the English have the worst teeth, the Arabs the best. He states that the Moroccans and Algerians have almost perfect teeth. He finds that the English and French soldiers are troubled with inflamed gums. So vital are good teeth to health that dental aid is being rendered to the English troops. All expenses necessary to render the men fit are met by the war office. The limit of £1 per man may be exceeded up to £3 when necessary (410). It is stated that during the Boer War (411) 2,500 were invalided home on account of the teeth. This was a loss of about one-fourth million pounds sterling to the nation. Dr. F. Newland-Pedley says the arrival of dental officers in the British army was needed and welcome. He, as a military man, urges the inspection and treatment of children's teeth from the time they are cut. He would have neglect punished by law. The dentist in the field should be prepared to treat caries and exposed pulp—to save as well as extract teeth. He points out that unlike the Japs in their war with Russia, the British troops in their retreat towards Paris left their tooth brushes—did not take care of their teeth. It might be well to give extra pay for good teeth and their proper care. He suggests that perhaps cutting the allowance of soldiers, their wives and children in times of peace if they neglect the care of their teeth might prove beneficial.

In the use of antiseptic powder, it should be allowed to stay in contact with the gums and teeth for some time if it is to be at all efficacious. The dental corps should make as frequent examinations as conditions will permit and the soldier in caring for his teeth should observe all the details used at home in the civilian state. (179)

Clothing. The results of military men's study of clothing may be observed with profit by all. The purpose of clothing is to protect from cold, heat, snow, sleet, rain, bruises, dirt, and diseases. It should be suited to the region, race, and purpose for which it is to be employed and of such texture as to be comfortable. Adornment is to be considered only in times of peace. It must be inconspicuous in color and

style and suitable for service. It should be of good quality, durable, of moderate cost and permeable to air. It should conduct and radiate heat properly. Its weight will vary with climate from 6½ to 11½ pounds. (116, Chs. III, VI, VII; 259, Ch. II; 133, Ch. I)

The hat should be light in weight with abundance of air space in the crown. The campaign hat with crown peaked is best suited for the field. It was found with an open air temperature of 90.2 deg. Fahr., the temperature in the crown of an old pattern forage cap was 100.5 deg. Fahr.; in the black felt hat it was 98.3 deg. Fahr.; in ordinary straw, 95 deg. Fahr.; and in cadet helmet 92.5 deg. Fahr. (259, Ch. II.) Black is the warmest and white the coolest color. Red is one of the most conspicuous colors and draws the fire of the enemy; white next, followed in order by black or dark blue, light blue, butternut, and dust gray.

Material for Clothes. Among the materials suggested for clothing are cotton, linen, paper, and wool. Leather cloth and oiled cloth have also been tried. Cotton and linen are conductors of heat. "A thin white cotton tissue worn over a cloth coat will reduce the temperature of the sun's rays 2.6 deg. Fahr." (259, Ch. I) Wool has proved most satisfactory under all conditions. It is practically a non-conductor of heat and absorbs moisture. It tends to harden with washing, hence care should be exercised in this. Though dark colors tend to retain odor, they are warmest. The Japanese in their Manchurian campaign used paper vests.

The articles forming the soldiers' clothing outfit consist in general of hat, underclothes, socks, shirt, coat, leggings or puttees, belt, trousers or if pressure from bending at the knees can be prevented, breeches instead, storm coat or poncho, pack and general equipment, and shoes. It has been found that it is better to use a belt instead of suspenders. There is a tendency to have both leggings and puttees too tight, which prevents free circulation, thus aiding in development of 'frost bitten feet', etc. For this reason one author suggests that a heavy woolen stocking pulled up the leg over the shoe

will fulfill the purpose of the former with greatest satisfaction. From reasons suggested above it is best to have the underclothing of some light color. It should be changed daily, and washed as often if possible. Where garters are used, care must be exercised that they do not impede the circulation. In cold seasons gloves are provided. The Mackinaw coat has proved more satisfactory than the overcoat. Khaki seems to have demonstrated its superiority as a material. In general, military attire must be inconspicuous in color, of good durability, quality, moderate cost, distinctiveness, and permeability to air, as well as have proper qualities of heat conduction and radiation.

Methods of Water-proofing. In some cases the clothing is water-proofed by coating the outer garments with rubber. The same is also accomplished by varnishing and oiling them. They may be made water-proof by impregnating them with lanolin in benzine or with aluminum acetate. (116)

One of the chief objects of clothing is to maintain normal body temperature. Experiments in India have proved that a layer of blood 1–500 inch thick is impermeable to most powerful sunlight (actinic rays). This was confirmed by tests in Manila in which men were clad in underclothing of red and white respectively and observed as to sickness and weight for a year. Those clad in red suffered most. The blood in the capillaries is sufficient protection. (133)

Clothes should not constrict at any point.

Shoe. The shoe is one of the most important parts of the soldier's equipment.

The following are some of the conditions it should fulfill:

1. It should be of good material and well made, having strength without undue weight.
2. It should be fairly pliable with flexible uppers (porous).
3. There should be no 'canoeing' of sole-welts which should be moderately wide.
4. The interior should be smooth, heel broad and low, sole moderately thick.
5. The arch should be flexible without metal shank or other stiffening.
6. It should have eyelets, not hooks for fastening, the tongue should lie smooth under lace.

7. Shoe should reach a little above the ankle, should be wide across the ball of the foot and have a high toe cap.
8. It should be easily put off and on.
9. It should have water-proof stitching of joints and seams with the sewing of tongue at least two inches up the sides of uppers.
10. It should have easy flexion of sole across line of tread with rigidity at waist.
11. The curvature of instep and heel should be natural.
12. It should be of proper size. The shoe should be tried on at the close of the day when the foot is swollen and hot; should be laced up completely. They should be broken in gradually. If it is necessary to use them at once it is a good plan to stand them in water till they are sodden. Then put them on and walk in them on level ground for about one hour. Let them dry on the feet. Upon removal rub them thoroughly with neat's foot oil. Too much care cannot be exercised in the selection of shoes. A size large is generally best.

Washing Clothes. Lelean urges the soldiers to change the clothing daily where possible. He suggests that underclothes be washed at least once per week and points out that the laundry water becomes bacterially infected very rapidly. Hence a steady flow of the water used is desirable or sterilization by chlorination. The blankets should be dipped in boiling water, then washed at once in warm water and dried without wringing. This will tend to prevent shrinkage and will kill the bacteria. Clothing should not be dried in the men's quarters. Another author suggests that wool be washed in cold water to prevent shrinkage. If water is not available at the end of the march or day, dry the clothes and then rub or beat them afterwards, hanging them in the open air. Dirty clothes, especially underclothes, increase friction, chafe, and thus put an extra tax on the body.

Equipment. The equipment should not exceed from 40 to 50 pounds or about 30 per cent of one's own weight. The web sling has proven the most convenient way of carrying. Avoid chest constriction; distribute the weight as evenly as possible. The pack should be made so that the entire load can be thrown off with one movement. The forms of pack are various—different nations prefering different styles. Con-

venience in carrying is the chief factor to be considered. The load should be carried not too high so as to interfere with erect posture. It should be carried well down the back and should tend to fall away from the body—not being in contact with it. The pack should be transported wherever possible in order to conserve the soldier's strength.

In times of rush, such as in the present war, care should be exercised by the government in the purchase of clothes; for there is the possibility of their being made under sweatshop conditions in most unhygienic surroundings. Here they may be infected and become disease-carriers. (274, 275)

EUGENICS AND WAR

From those who claim that war takes away the best to those who claim that it provides for their survival is certainly a wide range. And the data are conspicuous by their absence. In view of the fact that we cannot have data as to the accomplishments of the non-survivors had they survived, our conclusions must be inferential at the best. If the canons of selection used in recruiting are fulfilled, it would seem self-evident that many of the best, judged by every eugenic standard known, do perish, do not survive, do not propagate their kind. Yet in spite of wars the population has increased, even in war-ridden countries.

It is difficult to believe that the taking of so many young men and those in the prime of life from their homes, as happened in our Civil War, affects the country favorably in promoting the survival of the fittest. Though it is impossible to measure the effect by any standard known it would seem that the destruction of a large part of the productive force of the land must deter progress, must at least result in a sort of plateau on which the nation rests until it has recuperated and gathered momentum.

We know of no sufficient data either to substantiate or refute this assertion. In fact, as suggested in our introduction, machinery for the gathering of data has been absent.

War a Home Maker. In an article entitled, 'War as a Home Maker', Dr. Howard says: "War is one of the rhythmic conditions in man's progress." He thinks it brings out all the maleness in man and femaleness in woman. It is a powerful sex-establisher. It forces woman to her true sphere —the home and hearth and the bearing of children. Hence it is really a home-maker as well as breaker. (99)

He suggests that when the energy of the suffragette is turned to taking care of the wounded, etc., glands will function which will cause a proper balance in her whole being and make for normal sex life, and the desire to be mannish will disappear. The suppression of her emotions during the last forty years has caused her to turn to things other than those for which she is best suited and has developed hysteria and neurasthenia, etc. War gives scope to the maternal instinct, hence is beneficial. "Rampant feminism is not founded upon femaleness; it is a negative state—a form of psychic eunuchism." These emotions merge after the war into desire for children. This he claims accounts for the increased birth rate after a war. War follows a period of effeminization of men and masculinization of women.

That Dr. Howard is a true son of Adam may be seen from the following: "Indirectly and subjectively through the decline of male sex-honor, *women* have been the *cause* of *wars.*" " . . . wars make a strong man out of the weakling." He fails to state how this is established in the germ plasm. Those too weak to enlist will not be able to mate, for, says Dr. Howard, they will have no attraction for the normal girl.

With some of his concluding ideas we are more in accord. "The present colossal war will be the greatest school for personal hygiene the world has ever known since Moses kept his men and women clean through laws you should read and understand." He rightly points out that the discipline of the army, contact with nurses, and such vents as war offers for correct impulses, will send home survivors fit to marry, who will marry because of desire for true home

relations. And he thinks the women will be anxious to marry them.

Need of Providing for Future. Chambers asserts that the view is held by some that from a eugenic point of view war is beneficial, that the physical standards set and the habits of orderliness formed will tend to make the men better. Granting this to be true, it yet remains to be shown how this will effect a change in the germ plasm. It is pointed out by those who claim that the best are not lost, that the Scotch, the Zulus, the survivors of the Wars of the Roses, of the wars of Frederick the Great, were the best. On what evidence we are not told. To offset some of the evils, Chambers suggests that the marriage of those going to the front be encouraged. The state should provide for the families of those enlisted. He states that the professional class of workers will suffer most from non-employment as their services will be less necessary, while the industrial classes will probably be kept employed. That large class who furnish the leisure-time amusements of the people will have nothing to do, and the women, unable to take up other things, will suffer much. The results of this non-employment will be disgenic and the number of births will decrease. (34)

An anonymous writer says that in a voluntary army such as that of Great Britain the cream of the population certainly suffers. These are suggested as possible means of alleviating this to some extent: (326)

1. By increasing the birth rate of the depleted class and by taking every precaution that the greatest possible percentage of births of this class reach *maturity.*

2. With these objects in view, all who wish to marry before leaving the country should be encouraged to do so—the fullest security being given that every wife shall be well cared for and properly looked after in the husband's absence.

3. The wives and children of those who have gone to the front should be well cared for and encouraged to maintain the advantage already gained in the struggle for existence.

4. Every possible means should be taken to prevent the economic disturbances caused by the war proving disastrous to those who, by reason of age or other causes, have been unable to go on active service.

Disgenic Effects. Thomson gives the following disgenic tendencies of modern war: (233, 234, 235)

1. The best are killed.
2. The worst are left at home.
3. Women are affected.
4. Single men are lost.
5. Military training is not transmissible (not hereditary).
6. After-effects on home coming, limitations, etc., 13.8 per cent of the population of Britain—that is, 6,250,000 men—are between the ages of 18 and 45, the period of military service. When one-third or more, likely one-half, of these are taken from their homes, from their field of productive activity, it is not difficult to understand that the effects must set back the development of the race and civilization.

The wars of today are not the tribal affairs of yore. The latter did in a way eliminate the weaker, the cowardly. But the modern war, in which we have the volunteer, eliminates the virile, the strong. He suggests that the struggle for survival may mean a sharpening of the teeth and claws, or it may mean the fostering care of parents—subordinating self-preservation to the interests of the race. That is, coöperation rather than competition may be the method. Rather than an advanced state, war seems more properly considered a reversion to the primitive.

If, as some claim, the loss is confined to men, and that the good strong stock of women remain, it should also be remembered that if the latter propagate they must marry the inferiors left at home and thus the germ plasm will be tainted with a weak strain.

War Not a Natural Agent. Thomson rightly claims that environment is hardly comparable with war as a natural selective agency. As Dr. Sargent has pointed out, struggle is a biological necessity, for the life of the body as a whole depends upon it. But war is not such a struggle and is not necessary unless the life of the nation is threatened by starvation, internal uprisings, or invasion of an avowed enemy. (206)

The aeroplane, submarine, machine guns, long range cannon, have changed the character of war. Now there is little opportunity for personal prowess. Burrowing, trenching, ditching,

shooting from under cover have made engagements now stupid and dull. Naval battles are at long range. This, he states, tends to promote Asiatic fatalism. It is not fit material for the development of courage. This can be done better through proper exercise and athletics.

Some Probable Benefits. Thomson urges care in the employment of children under this war stress. Keep them under as normal condition as possible. He says: "There is patriotism in dying for our country; there is a conceivable patriotism in marrying for her and bearing children for her." We must watch the birth rate. Perhaps in a positive way the war may aid eugenics by calling attention to wastage from other sources, as tuberculosis. "Let us prune our comforts before we pinch our souls. Let us keep up art, music, etc., as much as possible." Do not cripple the supermen. He says that the following results may be expected: The war

1. Will demonstrate the need and value of sound constitutions;
2. May cause the inertia of present enthusiasms to function in ideals operative in the future;
3. May give an increased sense of solidarity among self-governing dominions of the British Empire.

In substance Dr. Rosenthal gives the following facts with reference to war and the protection of mothers.

The increase of the weekly allowance during the war by order of the federal council of December 3, 1914, and the fuller order of January 28, 1915, for the protection of mothers is of special significance. (197)

1. The husband must render military service or in consequence of the war be deprived of the resumption of his means of sustenance.
2. He must have been ill during a definite time.

The amount of this, measured according to wealth and the sick fund, is not a new operation.

1. To cover cost of confinement.....25 marks
2. An allowance of.....56 marks weekly
3. An allowance for the period of pregnancy of....10 marks
4. Up to the 12th week after birth 50 pf. (a final Stillgeld)

He urges the necessity of taking care of the mothers of industrial classes during the war.

War Babies. We have heard considerable about 'war babies', illegitimates, etc. The term 'war babies' is used

with two significations. By some, it is used to designate illegitimate children born through the lust of soldiers, chiefly those at recruiting stations. In general, as used in England, the term applies to children born of soldiers' wives. (328, 329, 330)

In Germany and England efforts have been made to have the departing soldiers marry properly. Hence we hear the term 'war babies' used frequently. This is a commendable move.

Ronald McNeill thinks that an enormous number of illegitimate children are about to be born. He wishes to make these wards of the state. While such a procedure is difficult, he thinks means should be employed whereby the children of the heroes of Marne et al. will not be stigmatized. (124, 190, 329, 330)

A rather careful investigation of the subject of illegitimacy and sexual intercourse among the soldiers has shown that the heroes of Marne have no such taint as might be inferred from McNeill's statements, and that the birth rate is not at all above normal in the regions of the recruiting and training stations or camps.

War and Sexual Life. We present in substance Touton's discussion of 'Sexual Life and Warfare':

What becomes of the women with whom the large part of men in the field have had intercourse, legally and otherwise, before leaving home for the front?

It must follow that reputable wives thrown into a state of continence are affected differently from those in the condition of elderly and young virgins, etc. For some of the former it is perhaps good, as it fits in with their condition. But wives of about thirty often suffer from the absence of their husbands, developing neurasthenia and hysteria.

He claims that many seek to be nurses merely that they may be with soldiers.

He found that many nurses, or those calling themselves such, were recently found infected with veneral diseases from the soldiers.

What has become of the camp follower (female) of former wars? He thinks she has emigrated to neutral countries when able. Many starve. Some change their calling. In cases of invasion, "In regard to outrages or harsh treatment of women of the conquered, the author is at much pains to introduce a *sadistic* element to explain them. The latter is believed to be always present in normal sexual relations. Lust is heightened if pain and humiliation can be inflicted upon the woman. War calls forth the latent sadistic impulses. Sadism is less marked in women, but in warfare mutilations are practiced on the invading soldiers which in times of peace would be reserved for faithless lovers."

" . . . war is to some extent an unaphrodisiac for the soldiers, for fornication usually accompanies high living and idleness." Soldiers are kept busier now than in ancient times. (236)

Influence of War on the Race. We have pointed out that there are still some who believe that war makes for the betterment of the race, and in our section on eugenics we have stated some of their positions. They usually present no facts upon which such conclusions can be based. In all candor, we have to state that scientific facts, either pro or con, of a true biological nature are very meager. Yet such as we have and the inferences from them, which seem logical, lead us to the conclusion that the best blood of the nation is lost. Not all of it, of course, but in such quantities as to impair the race. We are not prepared to accept the questionnaire method in the solution of this question, as used by Jordan and Jordan (114). But there are facts which warrant their presumptions relative to the Civil War, namely, in substance:

1. That our volunteers represented a better human element than conscripts, for they enlisted earlier, became the leaders, served longest, were more exposed, hence were lost in a greater proportion.

2. That the conscripts of the later periods saw less service, suffered less exposure, hence survived in greater numbers. Thus they were left to perpetuate their kind—the weak kind at that.

3. That those exempted for physical and other reasons, the residue, were free to reproduce their kind.

"The flower of the people went into the war at the beginning and of these a large part died before the end," say these authors.

They point out, as we have done, the difficulty of obtaining facts, saying:

In conclusion, we are impressed that with respect to the eugenic aspect of the Civil War we are dealing with matters insusceptible of precise determination.

Our discussion of the recruit and his training, as well as our direct quotation from Chambers and others, shows that the European conflict is taking the best. In modern wars this must ever be so. No state can maintain in time of peace the size of army seemingly thought necessary for war. Hence war depends, as we have shown, on the general population. It demands and takes the best from these civilians. The many measures suggested in England and Germany providing for the marriage of the fit ere they leave for the front is a tacit admission of the need of providing some means of sustaining the best blood of the nation. Schiller was correct when he stated, "Immer der Krieg die Besten verschlingt." "(War always destroys the best.")

Jordan points out that eugenic or racial decline may arise from

1. Destruction of the fittest, through war or other causes producing contra-selection or reversal of selection.

2. Emigration, by which the most energetic or enterprising pass on to other regions or in search of larger opportunities.

3. Immigration, by which the vacancies are filled by weaker stock, the beaten men of the beaten race. (110, 111, 112, 113, 114)

Greece declined when her best blood was lost through her wars, foreign and domestic, and the former slaves came in to rule.

"The Roman Empire," says Seeley, "perished for want of men." That is, she selected her best, her blue-blooded, to carry on her conquests and that to such an extent that the stock was depleted and the unfit left to propagate their kind. Hence the ignoble offspring were unable to cope with the barbarians of the north.

He suggests that Lucerne gave her best to sustain France and that today it seems to him the men of that province

represent a lower type. He points out that certain ailments (goiter, for example) were encouraged because they incapacitated men for military service and that the women refused to give the male children drugs which might effect a cure. Thus cretinism was fostered in certain regions and the production of offspring with a tendency to this disease encouraged. The strong, vigorous men were hired as mercenary soldiers to other European states. Spain paid the cost of imperialism by sacrificing her best blood until she is but a relic of her former greatness. He emphasizes the fact that Kipling has sensed the awful sacrifice England has paid for her colonies in the loss of her best blood to obtain and maintain them.

In speaking of Rome's decline he says, "Berry states that an 'effect of the wars was that the ranks of the small farmers were decimated while the number of slaves who did not serve in the army multiplied'. Thus *Vir* gave place to *Homo*, 'real men to mere human beings'."

Such facts as these show that while war, if continued long enough, draws on all regardless of quality, nevertheless, the best go first and suffer most so that the good stock of blood is diminished in greater ratio than the poorer. We are prepared to believe, of course, that good blood survived our terrific civil war. But the fund of it certainly was diminished by the scourge through which we passed. A study of the increase of population from 1840 to 1870, will show that the war had a deteriorating effect. Not only was emigration discouraged, but the natural increase of the native stock failed to measure up to the rate which might have been expected had the war not occurred. It should be noted that however good the remaining stock—the survivors—may be, that fact of itself cannot replace the lost blood of the nation.

Walker, Superintendent of the Ninth Census, says of the retardation of the national increase found in 1870, that it arose from the following probable causes: (164, Vol. 1, p. xviii)

> But for the war and for causes which, whether due to the war or not, came in at nearly the same time, the population of the United States might have been expected, according to ascertained rate of increase, to be in the

neighborhood of forty-one and one-half millions on the first of June, 1870. The rule of geometrical progression, has indeed been invoked by some to prove that our population, but for the war, would have reached forty-two and one-half millions. Walker thinks this rule is not so good as the rule of second differences.

	1830	1840	1850	1860	1870
POPULATION....	12,866,020	17,069,453	23,191,876	31,399,300	41,609,000
First Difference....		4,203,433	6,122,423	8,207,424	10,209,700
Second Difference..			1,918,990	2,085,001	2,002,000

Indians excluded, as previously.

It will require but a brief review of the notorious and palpable effects of war to account for the three millions which make up the difference between the population of the country as projected from previous experience and the population shown by the census.

FIRST. Retardation of Increase in Colored Population. Walker points out that the natural increase should have approximated one million whereas it was but 438,179. Continuing his explanation, "Drawn largely from the plantations, where their increase was natural, rapid and sure, to cities and camps, where want, vice and pestilence made short work of the multitudes hastily gathered, inadequately provided for, and left for the first time to their own control, while so much of the impulse to procreation as depended on the profits of slave-breeding was withdrawn by the abolition of chattelism, it is only to be wondered at that the colored people of the South have held their own in the ten years since 1860."

SECOND. Direct Loss by Wounds and Disease. At least 304,000 men of the Union army died during period of service (see former statistics). Over 285,000 were discharged for medical disability. It is but a fair estimate to state that of these probably one-third, 95,000, also died. "Tens of thousands were discharged to die; tens of thousands died within the first few months after discharge. Tens of thousands lingered through the first or second year. If in addition to these numbers, we allow for the accelerated mortality of the two million persons enlisted in the service of the United States who neither died in service nor were discharged for disability, but who *carried with them the seeds of disease* contracted under hardships and exposure of campaigns, or returned to civil life with shattered constitutions though with no developed disease, *500,000* will surely be a moderate estimate for the direct losses among the Union armies."

The probable losses of the Southern armies were at least 350,000. "We reach, therefore, the total result of a direct loss to the *male* population of the country of not less than *850,000*. Popular opinion would undoubtedly place this total higher, and in such a matter, popular judgments are quite as likely to be correct as judgments formed from the contemplation of statistical data necessarily partial and incomplete."

And these facts do not express at all the loss among the civilian population, the sufferers at home.

THIRD. The Indirect Loss by the War in the Check given to the Native Population.

There were in the North over one and one-half million men drawn from domestic life for a period of three years; in the South probably about one million men for the same period. Of these perhaps one-half were unmarried and their relations during these four years were such as to discourage and prevent the formation of domestic relations then and in subsequent times. The other portion, separated from their families, were also prevented from fulfilling the marital relation. We have here an important factor in deterioration of population, in both quality and quantity. These men were between the ages of 18 and 45—years of productivity. In the South they were taken even younger; at a time when least able to endure strain.

FOURTH. Indirect Loss by the War in the Check to Immigration.

For the four years preceding the war the number thus entering our country was 649,354; during the four years of the war, it was 553,605; while in the four subsequent years it was 1,163,128. Hence there was probably a loss of some 350,000 from this source.

FIFTH. Habits of Life in Sections of the Country.

Walker has pointed out that the increasing tendency to luxurious life, to urban in contrast to rural life, to lack of the desire for children, etc., were factors making for a lower ratio of increase in population.

In the light of the facts afforded by the investigations of the Balkan Commission and revealed by the trend of the history of imperialistic nations, as well as in consideration of the character of the English, French, Germans, Russians, Italians, etc., who are forming the great armies of the present struggles, it seems evident that the best blood of the nations is being lost and—remembering the usual results of wars—wasted.

VI. BENEFITS TO THE GENERAL POPULATION IF:—

a. It should follow as efficiently as soldiers, the training and care the latter have in hygiene; and

b. The efforts now expended upon soldiers alone, were expended upon the general public.

Function of War in Hygiene

War serves to point out the particular hygienic and sanitary factors which reduce its horrors and make possible the successful accomplishment of its purposes. In this sense, it is a benefit to mankind, but at such a fearful cost that it would seem that calm, careful consideration of the same factors and daily observance of them would accomplish much more with less effort and expenditure. We should remember that the progress of military hygiene and sanitation, though stimulated perhaps by war, has been possible only in times of peace. The study of typhus, typhoid, etc., was made, not during war times but in peace, and the efficiency of treatment depends upon following proper measures at *all* times. Yellow fever was investigated, conquered, and driven from Havana, New Orleans, and Panama during a period of peace. So, too, with the conquest of malaria, beri-beri, cholera, etc.

During the occupation of Vera Cruz by the United States army from April 24 to Nov. 23, 1914, there was smallpox among the citizens, with little or no vaccination; flies were numerous from lack of proper scavenging; tuberculosis was prevalent and there were some cases of cerebro-spinal meningitis; the malarial season was due. The houses to be used for barracks were immediately cleaned and disinfected. The companies' kitchens and mess-rooms were screened. As a prophylactic, 3 grains sulfate of quinine were given daily to each man. Provision was made for the proper disposal of sewage and garbage. The latrines dug were made fly-proof and were

burnt out twice daily with 7½ lbs. of hay to 1 gal. crude oil. Manure and rubbish was sent to the destroyers. The picket lines were kept cleaned and burned over once a week. Baths were installed; 69,000 gals. of crude oil were used on the stagnant water of the neighborhood; 61 miles of drainage ditch were dug; 46,420 vaccinations were performed. The city was inspected every five days and the food was regularly examined. The deaths from malaria fell to one-tenth of the average. Prophylactic packets for venereal diseases were issued to civilians as well as soldiers. Suspected women were examined weekly. It was found that of the registered women, 25%, and of the clandestine prostitutes, 90%, were diseased. The army had during this period, no cases of typhoid, no cerebro-spinal meningitis. Such cases of dysentery as occurred were fly-caused. There was one death from this disease. Such results probably could not have been accomplished under stress of war. (22, 297)

Training of the Soldier. Advocates of militarism have pointed to the great benefits to be derived from military training. The conditions under which this training is taken have warranted such a conclusion. It should be observed, however, that should civilians follow the same methods with the same degree of tenacity and spirit—as many do—the result would be even greater than is possible under the stress of war. For as we have already shown, the previous hygienic training of the general population of Germany and Great Britain has resulted in the acceptance of more applicants under most strenuous physical requirements and has lessened the amount of preliminary practice necessary to make efficient soldiers of active men whose lives have been spent in labor, business professions, etc. War serves but to *emphasize* the factors which should function at *all times*. It shows how costly the neglect of health may be, not only in war but in peace. The warrior of today of necessity must have been the citizen of yesterday. War serves to show forcibly the need of following simple laws of health, of obeying the seemingly trite rules of hygiene. (8, 32, 91, 92, 106, 208, 239, 243, 249, 260)

Personal Hygiene. From this it is easily seen how important it is that the soldier pay attention to his personal hygiene. This means cleanliness of person, hence care of the body and mind. For the accomplishment of this, training of such a nature as to fix correct habits must be given. Men of roving, discontented, unambitious natures do not make good soldiers. Men who have been accustomed to home comforts may suffer much from nostalgia. For such it is necessary to supply that which will occupy their minds and bodies to the exclusion of insistent recollections of home and its ties. Crowded together as they must be, it is more essential that each keep his person as clean as possible. One man can scatter disease-carrying vermin through a whole battalion, thence through the corps and army. An illustration of the persistence of racial habits formed in time of peace is shown in the fact that in certain of the trenches held by the English, vermin give little trouble; while in sections held by other troops the vermin become a pest. Military hygienists attribute this freedom of the English troops to their habit of taking baths, cold water especially, at all times and under all sorts of conditions. The difficulty of eradicating vermin when once they are started among troops is due to the utter impossibility of having adequate bathing facilities for the men and for washing and disinfecting their clothing in camp and under battle-field conditions. Army life is conducive to the development of certain skin diseases which can be controlled only through extreme cleanliness. (116, 133, 220, 362, 440)

Bathing. The soldier then should habituate himself to bathing often. If it is impossible to take a daily warm or cold bath, he should at least cleanse the arm-pits, the crotch, the feet, face, and hands. To avoid infection, he should wash the hands after defecation or urination. If water is not available, he should take a dry rub with a coarse towel. The scalp should be washed at least once or twice per month and given a daily rub with the fingers or a brush. With a little ingenuity, various sorts of baths can be rigged up. The English troops have succeeded in making a sort of shower bath by means of

which four times as many soldiers can take baths with the use of about one-fourth the amount of water as in tubs.

Teeth. The soldier is a fighting engine whose efficiency will depend upon the number of calories it is able to get out of the food taken in. Physiology has shown that proper mastication is necessary to obtain the maximum. But the important tools of mastication are the teeth. Hence they should be in good shape and kept that way. It is for this reason that special dental corps have been advocated for the treatment and care of the soldier. As showing how habit functions, we may repeat that the Japanese carried their toothbrushes with them incessantly as a part of their equipment, quite as essential as their weapons. In contrast, the English, who have not learned the same stoical sort of obedience, left theirs behind in their retreat towards Paris.

Clothing. It should be remembered that dirty underclothes chafe. Chafing is not only an irritation, but also consumes caloric energy wastefully. If possible the underclothes should be changed every day or every other day, those worn should at least be removed, dried, and rubbed thoroughly. When possible use soap in washing the body and clothing. Since part of the clothing is of wool, special care should be exercised in washing else the garments may shrink, become hard and thus cause irritation. For this reason they should be washed in cold water and not wrung out. When water is not available, the garments should be dried, rubbed, or beaten, and hung in the air. If this is done in sunlight, the result will be a species of excellent disinfection as the sun's rays are fatal to many germs. (116, 133, 259, 260)

Diet and Eating. The soldier should be able to cook his own food for he may be thrown upon his own resources at any time. The lessons of the past with reference to the extreme necessity of proper feeding have been learned; this branch of the service is well organized. Instead of being expected to get his meal after everything else has been attended to, his meals are made as regular as possible. On the march, the first line of transports carries everything essential to the wel-

fare of troops. The second line carries the baggage train and material not immediately needed. Camp kettles are expected to reach the front with the first unit and to be put into action at once, so that the meal is ready at least within two hours after the arrival of troops in camp. Smokeless, traveling kitchens—some drawn by two horses and capable of cooking for 250 men—are being used extensively. These can be started with the beginning of the march and be ready for serving soon after halting. (133, Ch. III)

One writer states that the body needs about 3,000 calories of which 2,400 are for heat. Whether the body is at work or at rest, it is necessary to maintain a certain heat equilibrium. For this reason the heat must not be allowed to accumulate in the body. Nature's way of taking care of this is through evaporation, radiation, conduction, urination, and respiration. He claims that the optimum condition of marching is a temperature of 100.5 deg. Fahr. with a maximum of 102 deg. Fahr. Increase over this is dangerous. Now it has been found that the soldier loses about a quart of water in every 7¼ miles marched under average conditions. The loss of 1 gallon is dangerous and of 1½ gallons results in death. Hence the necessity of the soldier's taking in water, in certain amounts at intervals. The data indicate that about one quart of water is needed for every 7½ miles. It is quite necessary to have the soldier form the habit of drinking such amounts at such intervals and avoid drinking between times. It is well to take copious drinks of sugared hot tea or coffee preceding a march. The old idea of sucking a pebble is good because under these conditions the individual will probably keep his mouth shut, thus keeping out dust and preventing dryness of the throat. (133, Ch. III; 116, 259, 260)

As a general rule neither civilian nor soldier drinks sufficient water. Keefer advocates the drinking of from six to eight glasses of water per day. This tends to irrigate the kidneys and to prevent constipation which gives rise to biliousness, piles, headaches, and mental depression.

Preceding a strenuous march or action, the soldier should

eat a large meal. So far as possible the heavy meal should come toward the close of the day. Nor should the soldier after marching all day have to wait a long period for his meal, say two hours. For his state of fatigue may be such, that by this time he will be asleep and will prefer to forego his food rather than wake up. The final result may be that he will form the habit of neglecting to eat properly at correct intervals.

While his previous training as a civilian may have caused him to avoid extravagance in eating, there may be a tendency to let down the bars of inhibition under the emotional strain of a city conquered and invested and to indulge in excesses. It is impossible to fix too firmly the habit of temperance in all things. It should be impressed upon him that excess in eating leads to biliousness, to forms of dyspepsia, or to excessive waste, and that such waste has an irritating effect upon the kidneys, often causing gout, obesity, and hardening of the arteries. Beefy, overfed men are liable to apoplexy.

Keefer has put forth the following "Dietary Dont's for the Soldier":

1. Don't Fletcherize to an extreme—avoid fads.
2. Don't eat hurriedly.
3. Don't swallow a morsel till it is thoroughly broken up and mixed with saliva by chewing.
4. Don't overload your stomach—get up from the table feeling that you could eat a little more with a relish.
5. Don't eat unripe or over-ripe fruit.
6. Don't eat anything while away from camp or barracks whose material or preparation may seem questionable.
7. Don't bring worry or 'grouch' to table with you.

Other Factors. The old admonition to get plenty of fresh air should be urged upon the soldier. Drafts do not give colds. Colds are germ-caused.

Busy as the life of the soldier may be in war times, even he needs variety in the form of exercise to keep his mind and body in the highest stage of efficiency. This means that recreation should be a regular part of his round of occupations. Card playing, physical games, etc., are necessities of his life.

The long, tedious waits in the trenches are much more trying than the charges, the movements of battle, or the march. For such periods diversions of a recreative sort should be provided.

Temperance in all things is necessary. The soldiers should be shown that sexual indulgence is not necessary for health and is especially dangerous under the conditions in which he is living.

And though battles occur at all times, even the soldier *must* rest. He should have eight hours' sleep per day and should be so drilled that he can take it whenever opportunity presents itself.

Not only should he fulfil the canons of cleanliness himself but he should demand their fulfilment by those about him. In fact, it is impossible for him to keep clean unless his associates do the same.

Physical Training. "To develop a complete man is the function of military hygiene," writes one author. How familiar this sounds!—for such is the function of all true education. It merely emphasizes the fact that the fully developed man is the one best prepared for this as for every other exigency of life.

Woodhull says the function of drill is to give the recruit the essential knowledge of maneuvering, etc., and to harden and prepare him for real work. This drill should be within the powers of the recruit; should he fail to show signs of proper adjustment he should be turned over to a medical officer. The development should be gradual, for such training cannot be hastened. Woodhull is considering the usual type enlisting in peace times and not the finer qualities of the modern volunteer soldier. (11, 116, 121, 133, 183, 259, 260, 439b and h)

Keefer and Major Lelean both call attention to the importance of considering the psychic as well as the bodily make-up of the soldier. The interplay of the physical and psychical factors, hitherto only cursorily considered, is receiving much attention. Its significance has been in evidence many times in the trenches, among the wounded, and in actions. The demands upon the intelligence are greater than formerly and

the warrior of today must not only be organically sound but must possess more than the average strength, endurance, and organic vigor. As Keefer points out he must be trained to husband his energy, to become confident, skilled, self-reliant, and courageous; for which smartness, agility, and precision are needed. These combined constitute discipline. Surely we need training in everyday life that will give us such results and such discipline. (174, 363, 408, 409, 439e, f and g)

Lelean states that big muscles are not the object to be sought in training the soldier. Such may defeat the real purpose, for they may give a species of muscle-binding fatal to full and free action. What is needed is symmetry, all round development. He writes that in the beginning, "The skeletal muscles are atonic and the interfibrillar spaces filled with fat. The right side of the heart is apt to be overdeveloped or overused, causing undue dilation of the right auricle. Because of an excessive amount of carbon dioxide reaching the respiratory centers, we may have an exaggerated action of the respiratory muscles. There may be an accumulation of waste products, excess of sarcolactic acid and a dicrotic pulse." The objects of training are put by him as follows:

1. It should get the muscles into shape with the least waste.
2. It should develop the regulation of blood flow and pressure properly.
3. It should bring about proper respiratory adjustment.
4. It should provide for the taking care of excretion.

Hence the exercise given for this training should take into consideration the racial attributes of the soldier, his present condition and physical aptitude, the facilities, the time, and the instruction material. The work should be adapted to the individual, and not *vice versa*. This is a rather modern view in military circles and reflects the psychology of individual differences.

Keefer points out four classes of methods used in training the soldier, namely, (1) hygienic, (2) educational, (3) medical, and (4) military. For the last, instructional material should be provided for the following:

1. Setting-up exercises
2. Marching, double time, run
3. Rifle and saber exercises
4. Climbing
5. Jumping and vaulting
6. Applied gymnastics, apparatus
7. Gymnastic contests
8. Athletics and games
9. Swimming

A perusal of this list will serve to indicate that *all* of the muscles are to be developed. In the case of the young recruit it must be borne in mind that the equipment he carries tends to interfere with the proper movement of the chest and vital organs and that for this reason his muscles should be gradually accustomed to bear the strain. For the older men, old muscular habits will have to be broken up and brought over to function in new ways. The officer therefore at this stage will have to consider, as far as possible, the individual rather than the mass. Major Lelean suggests that the trunk muscles should first be taken care of, and that to do this most efficiently, the maximum daily exercise should not exceed five hours. In the beginning there should be no equipment carried or used. It should be added gradually until the recruit is able to carry the whole kit. The back and loin muscles should be developed first.

While the present war especially in the western regions has involved much trench fighting, besieging, etc., it must be borne in mind that marching still occupies much of the soldier's time, much more than does combat. This is clearly seen in the Russian campaigns. For this reason it is of prime importance that the soldier be able to march well.

The general public have a mistaken idea of the length of a heavy march, the tendency being to place the estimate altogether too high. A fair day's marching for an army is 12 miles. The strenuousness of the march depends to a large extent upon the size of the marching force. A good day's march consists of 15 miles while 20 constitutes a forced march.

Quick time for the English armies consists in about 120, thirty-inch steps per minute, which gives 100 yards per minute. From 2½ to 3 miles per hour is good marching. It takes a brigade 6 hours to march 15 miles while a division needs 8 for the same distance.

Since in marching all the muscles of the body are used, the training should be symmetrical. A few hours of work in the beginning are better than strenuous efforts. The process of hardening should be gradual. The psychic factors of course enter in; the men, anxious to make good soldiers, trained already to making their bodies the servants of their will, soon accustom themselves to the new régime and become efficient most rapidly.

Lelean offers the following practical suggestions (133):

1. March early in the day, never late if it can be avoided. Avoid the heat of the day.

2. The speed in the beginning of the march and at the end should be slow.

3. The troops should alternate between marching in step, at ease, and with song and music.

4. It is best to march in open order, half the troops on each side of the road leaving a space between them.

5. It is a good idea to leave the chest bare as through this process, especially in warm weather, the body temperature is reduced ½ deg. Fahr.

6. Halts of 5 minutes to the hour, with 30 minutes at the half way point, should occur. At this point (half way) a full rest should be taken, equipment being laid aside, the soldier lying down. When resting the soldier should accustom himself to *utter relaxation*. The first halt should be made a short time after the start. The subsequent rests should occur at intervals of about 7 miles.

7. In the matter of conservancy there should be strict discipline. Excreta should be buried with the trench tools, definite places having been assigned in advance by officers for such.

8. Contra indications forbid the use of alcohol or smoking while marching.

9. Preceding a long march the food should be light. After proceeding about two-thirds of the way, light food should be served. Each man carries the remains of his last bread and cheese ration. As previously suggested the main meal should be served at the close of the march or in the evening. It is a good plan to serve tea at least at the conclusion of the march and the full meal not more than two hours later.

10. We have already indicated the nature of cooking requirements.

First Aid. One of the requirements that has received much emphasis in recent years is that of instruction and practice in first aid. Each soldier of the German or French or English army is provided with a first aid outfit in the use of which they

have been instructed. In every case it is carried on the person whether marching or in battle. The results obtained have warranted all efforts put forth in this line, for serious infections have been avoided, minor ailments tided over until more exact treatment could be given, and a spirit of confidence instilled in the soldier. Many of them, before becoming accustomed to battles, believe that bleeding to death is quite common and are in constant fear of it. Upon seeing the efficacy of first aid rendered their comrades in the battle itself, they have had their fears alleviated. Such kits consist for the most part of sterilized bandage and gauze, absorbent cotton treated with mercury bichloride, in a water-proof case. (15, 76, 84, 85, 105, 184, 267, 279, 439d)

Swimming. Among the instructions given to soldiers and sailors on transports is that in case of accident, when they find themselves in the water, they should not attempt to get rid of their clothes, for in addition to the loss of energy thereby, they also lose part of their buoyancy. The clothing being filled with air tends to keep them up, and as it will take some time to displace this air, clothes will serve for some time as an aid rather than hindrance. (407)

The Medical Corps

History. No adequate history of the part played by the medical corps in any war has been published to date. We know that woman, as an individual, performed the task of taking care of the wounded in the beginning. The burden in later times was undertaken by the barber, and following him the monk. But the amount and nature of the service rendered is not fully known. A real history of the work of this branch of the service is needed; for a summing up of the achievements of the medical corps would prove valuable in many ways. Such a production would give needed facts,—a record of heroic deeds unheralded by fame—and also indicate the lacunæ to be filled. (377, 378, 379, 380, 381)

Organization. The nature of this book and the limitations

of space prevent anything but a very brief discussion of the organization of this corps. It varies in the different countries. In those having a large standing army, the problems are different from those where the dependence is upon volunteer soldiers. Yet each seems to have worked out a very efficient system, England no less than Germany. The same general purposes are served by all, though the methods of procedure vary. For details, the reader is referred to the bibliography. Lelean's treatment of this subject is good. In fact, it is the only complete one we have found. Keefer's outline or diagram,—Fig. 33, p. 201—is suggestive and self-explanatory. It is necessary to remember that the organization involves the proper care of those at home, the source of future soldiers, as well as those in battle. (390, 391, 392)

Sir Wright states that the corps must be organized on these lines. (1) Service of Administration; (2) Service of Hygiene and Sanitation; and (3) Service of Treatment of the Sick and Wounded. The first cares for the wounded on the battlefield and for field hospitals, clearing hospitals, conveying wounded to dressing stations and thence to ambulance trains, embarking, and finally landing him in home hospitals; also for accommodations, feeding, bedding, clothing, nursing, medical treatment rendered in transit. The second protects from epidemics by attending to water, conservancy, anti-typhoid inoculation, infectious diseases, carriers, bacteriological laboratories, etc. The work of the third department falls largely upon non-military doctors. Each follows his own methods of treatment. But Sir Wright thinks it would be better to have one general method of treatment instead. As in private practice, it would be better to have each physician follow the case with which he starts through its whole course. (116, 133, 173, 382, 383, 389, 390)

Other large topics which might engage our attention are, ambulances, hospitals, field service, and the Red Cross. The literature on these subjects is extensive. The bibliography will indicate sources of data. (51, 87, 122, 384, 385, 386, 387, 388, 394, 395)

Sanitation. Interesting as a novel, instructive and profitable as a course in hygiene, and marked by unheralded deeds of heroism is the record of the achievements of the medical corps along sanitary lines. Dr. Lazear, Dr. Carroll, Nurse Maas, and many others exhibited a grander patriotism and sublimer courage than that demanded of the soldier in battle. It is well to remember them, for theirs is a work of peace, a work which profits *all* times—even those of war.

The Study of Yellow Fever. In order to demonstrate that yellow fever is not contagious, not taken by contact, the Reed board built a small almost air-tight house, with very little ventilation, screened windows, and double screened doors. In this were placed mattresses, bed clothing, and pajamas of the patients from the Las Animas Yellow Fever Hospitals. In addition, basins of black vomit and excreta from the yellow fever patients were poured on them so that every possible chance for contact infection might be offered. Volunteers were called to sleep in this house, dressed in these pajamas, and on these mattresses. No trumpets beat—no legions hurrahed—no flags waved. But Dr. R. P. Cook and several soldiers came forward and spent twenty nights under these conditions. Thus was demonstrated that yellow fever is neither a contact nor a filth disease.

The organization, system, discipline, etc., of the army make it possible to carry sanitary measures into effect. By such means, with the hearty co-operation of her citizens, was San Francisco saved from plague. (115) Thus was New Orleans, after being frightfully exposed by vacillating officials, finally rescued. (418)

Cholera. The achievements of Great Britain in fighting cholera in India were possible through her military organization. Upon our advent in the Philippines, it was possible to use our military forces in cleansing the cities. Malta fever, dysentery, and cholera were thus brought under control. Finding that Porto Ricans were suffering from anæmia—our forces were able to fight a successful campaign against the parasite causing the suffering. Cuba, Porto Rico, and Panama suffered

much from malaria and yellow fever, but through the long, arduous investigations and discoveries of military sanitarians and the faithful execution of their suggestions, the tropics have again become habitable to men of the temperate zones.

"There has been a great deal of discussion as to who deserves the credit for this great discovery of the mode of transmission of yellow fever. Undoubtedly Reed and his board brought all the threads together and actually made the great discovery, but Finlay, Sternberg, Carter, and others started the spinning of many of these threads. Like all great discoveries everywhere, it was gradually led up to by many workers.

Nothing is more true than the following quotation from Huber's papers: (72, pp. 75-76)

> And let me premise here that, in science at least, great names are landmarks; and the owners of these names have traversed and gleaned in fields where many a devoted laborer had delved and sown, and practically sweated blood in his altruistic zeal. In science at least no man works in vain. Full many an one, worthy of an elegy, has given his whole life to establishing a fact, or indeed only an item to a fact; his work unrealized, ridicule and even persecution ofttimes his only compensation, throughout perhaps in the meanest destitution; yet his life and his work have been absolutely essential to the building of a mighty fabric. Martyrs have been many among such—dying from the diseases from which they sought to defend others; knowing, too, full well what their own fate would be. Nor does it in any wise detract from the gratitude due the great man that he has profited by the labors of others, adding what he can of his own, scrutinizing every detail. every datum, permeating and illuminating with his own genius, cementing the mass with his own deductions.

And from Flexner:

> Remarkable achievements are never unique occurrences in nature. Even the greatest men rest on the shoulders of a multitude of smaller ones who have preceded them; and epochal discoveries emerge out of the periods of intellectual restlessness that affect many minds."

Panama Canal Made Possible. Indicative of the accomplishments of proper hygiene and sanitation, carried on under a military routine, we present the following from Colonel Gorgas' "Sanitation in Panama."

Now let us consider the totals: we had an average of 900 men sick every day. For the year, this would give us 328,500 days of sickness, and for the 10 years 3,285,000 days of sickness. If our rate had been 300 per 1,000, a very moderate figure compared with what it was under the French, we should have had 11,700 sick every day. For the year this would have given us 4,270,500 days of sickness and for the ten years, 42,705,000, a saving of 39,420,000 days of sickness during this period. This saving must justly be credited to sanitation.

It cost us about one dollar a day to care for a sick man on the Isthmus. The Commission cared for the sick free of charge. Every day, therefore, of sickness prevented on the Isthmus lessened the expense which the Commission had to bear by one dollar. The Commission was therefore saved by this sanitary work, if we consider the whole ten years of construction, $39,420,000.

This represents only one phase of the saving due to sanitation, merely the saving due to decrease in the numbers of sick who had to be cared for. But the sanitary work really saved much more than this. If three hundred men out of every thousand of our employees had been sick every day, the efficiency of the other seven hundred would have been correspondingly decreased. The other seven hundred would have been more or less debilitated and more or less depressed, and the amount of work turned out daily by each man would have been considerably less than it actually was for the employee enjoying good health and cheerful surroundings. We should have had to pay considerably higher wages, if the Isthmus had continued to bear the reputation during our period of construction which it had always borne during the years preceding 1904; if, for instance, it had been known that three out of every ten men going to work on the canal would be sick all the time, that two out of every ten would die each year, and that the whole ten would be dead at the end of five years.

Great loss was caused to us in the first years on the Isthmus by the demoralization among the working force, and almost stoppage of work which took place during periods of exacerbation in the yellow fever condition, or when prominent employees died of that disease.

Considering all these factors, it will not be considered an exaggerated estimate to state that eighty million dollars was saved by the United States Government by the sanitary work done on the Isthmus during the ten years of construction. . . .

During the ten years of construction, we lost by death seventeen out of every thousand of our employees each year. That is, from the whole force of 39,000 men, 663 died each year, and for the whole construction period we lost 6,630 men. If sanitary conditions had remained as they had been previous to 1904 and we had lost, as did the French, two hundred of our employees out of each one thousand on the work, we should have lost 7,800 men each year and 78,000 during the whole construction period.

We therefore claim for the work of the Sanitary Department the saving of 71,370 human lives during the building of the Panama Canal. Where one man died probably three would have returned home broken in health, with months and years of suffering and invalidism ahead of them. Sanitation of the Isthmus has saved this heavy toll to the devoted people engaged in this great work, and was therefore a most wise and lucrative investment to our Government, and played a most important part in aiding the construction work in that great enterprise.

Gorgas rightly considers that greater than the contribution already pointed out is the demonstration that tropical regions can be safely inhabited and hence developed by men of the temperate zones.

Barracks and Camp. In the selection of the site for these, strange as it may seem to some, the same factors are considered as in locating a public building such as college or school. While the exigencies of war prevent a literal fulfillment of these conditions, efforts are made to meet them. These factors are (1) Surroundings, (2) Aspect and Elevation: one writer has well said, "Where the sun never goes, there the doctor must go." For this reason it is essential that provision be made for proper sun, wind, weather exposure. The direction of the prevailing winds is considered in the location of barracks or camp, temporary as well as permanent. Woodhull suggests that a screen of woods should be kept between enemy and camp if possible. (3) Drainage—As the refuse from the kitchens, men, and beasts will be concentrated within a relatively small space, this is especially important. Closely related to drainage is (4) the Nature of the Soil and Subsoil. A fulfillment of necessary conditions along these lines will lessen the time and trouble needed to get rid of flies, roaches, mosquitoes, etc. Dense vegetation tends to keep fog close to the earth. For this reason it is well to clear away tall grass, etc. (116, 133, 259)

Barracks should be constructed of such material and in such a manner as to be dry, warm, well lighted and ventilated, and rat-proof. Keefer advises that for each man in the squad room, there should be 60 sq. ft. of floor space and 600 cu. ft. of air space. This is the minimum; 60 sq. ft. of floor space

with 800 cu. ft. of air space are better. Woodhull suggests the following: 50 sq. ft. floor space and 600 cu. ft. air space; south of latitude 36° North, 70 sq. ft. and 800; in India from 75 to 150 sq. ft. and from 1,500 to 3,000 cu. ft. In a room 15 ft. wide one man should be allowed to each yard of length; from 15 to 25 ft., 2 men per yd., and where more than 25 feet wide 3 men per yd. of length. There should be 3,000 cu. ft. of fresh air per hour for each man, which means that a space of 100 cu. ft. must be changed 30 times per hour. The room should be from 12 to 14 ft. high and not wider than 24 ft.

The bunks should be at least one foot from the wall and should be kept clean. The tendency to throw dirty clothes under them and also under the pillows (seen in summer camps for boys and girls also) should be eradicated. Beds and bedding should be kept clean and aired often, at least once per week. The same is true for tents.

It is unwise to flush the floors with water for the purpose of cleansing them. Dry cleaning is more hygienic. Care must therefore be exercised in their construction and composition.

Everything and every person connected with the mess should be kept clean. Cooks should bathe daily and dress in clean clothes daily if possible. One author recommends white for this purpose.

Camp and Battlefield Sanitation. In halts in marching and in the establishment of camps, one of the primary measures is to establish latrines, etc. That these shall be used properly it is necessary to have special sentinels over them and to punish abuses severely. These latrines should be easy of access but at least 100 feet from the cooking quarters. (155)

Lelean states that of the total average amount of feces passed per person daily, 3 oz. is water and 5 oz. urine. With a body of troops this totals such an amount that it is impracticable to evaporate it. Hence some other way has to be provided. He states that it has been found that 66% of the weight of the urine in sawdust will permit evaporating it by burning. For a regiment of 1,000 men about 100 lbs. thus used is efficient. A horse requires the equivalent of four men

in the incineration of its feces. From this it is seen that it is necessary to keep liquid and solid waste separate. Separate receptacles should be provided for the dry and fluid waste of kitchen and camp. Our discussion of our army in Vera Cruz has already shown how latrines and drainage may be taken care of. For further data along this line, the reader is referred to Keefer (Ch. XII) and Lelean (Lecture VII).

Water Supply

It is pointed out by one writer that moving troops are not, as a general thing, bothered so much with enteric as stationary troops. This he attributes to their own excretions which the latter neglect to take care of through cleanliness, and to neglect of water supply, and of control and elimination of flies, mosquitoes, lice, etc. (422, 423, 425, 426, 427)

Selection and Protection. The importance of water in curative and preventive medicine in connection with food, cleanliness, and regulation of body temperature, needs no further emphasis here. In the selection of a camp, too, it is carefully considered. (133, Ch. VIII) Through a proper consideration of (1) disposal of garbage and refuse; (2) provision of suitable water supplies and prevention of their contamination; (3) drainage and conservancy, and (4) control of infectious diseases and disinfection, only 10 cases of typhoid occurred in a body of 600,000 troops, from the beginning of the war up to Oct. 10th, 1914. (88, 116, Ch. VIII)

Major Lelean offers the following data on the water supply:

	AMOUNT NEEDED	*Daily*
a.	Each man should have, in barracks	20 gals.
	Each man should have, in standing camp where clothes are washed	5 gals.
	Each man should have, in camp where no clothes are washed	3 gals.
	Each man should have, in bivouacs for drinking and cooking only	1 gal.
	Each man should have, for drinking only a minimum of	3 pints

b. Daily requirements for animals

Each horse or camel	10 gals.
Each ox	8 gals.
Each mule	6 gals.
Each donkey	5 gals.
Each sheep or pig	2 gals.

The same factors enter into the selection of water as those involved in corresponding municipal problems,—source, dangers of contamination, etc. But greater efforts have to be expended in purification since prevention is not so easy under war conditions.

Purification. The following methods of purification are suggested by Keefer:

A. Sedimentation. B. Precipitation (as thru use of alum). C. Filtration. (1st. Thru a 3-foot layer of sand; 2nd. Thru a mechanical filter in connection with alum or iron with lime.) D. By use of copper sulfate. E. By use of chlorine gas. F. By use of ozone. G. By means of ultra-violet rays.

Boiling the water is the surest means of killing all germs. Various devices are being used by the various armies in the present war. In some cases their construction has not been made known to the general public. Some have been used hitherto and described.

Enteric germs will pass through a very thick layer of sand (15 ft.) Lelean reports. Hence this is not a good means of filtration. As bacteria are protected from ultra-violet rays by organic matter held in suspension in water, this means can be employed only when the water is clear.

Clarification by precipitation may be brought about by adding 5 grains of alum and 1½ of sodium bicarbonate to the gallon of water. Or add one teaspoonful of alum to 100 gallons of water, letting it stand until settled, when the clear water should be siphoned off. If it is disturbed, the process will be reversed.

Thresh suggests the sterilization of potable water by adding 1 part chlorine to 1,000,000 water or from 1 to 2 parts if the water is foul. The troops should carry with them:

1. A high quality of chlorinated lime in ¼ lb. cans, hermetically sealed.
2. A corresponding number of ½ lb. packets sodium thiosulphate (hyposulphate combined with chlorine).
3. Add one can of No. 1 to one gal. of water and shake well.
4. Add one packet of No. 2 to one gal. of water and shake till dissolved.

(1 gal. of No. 3 will sterilize 8,000 gals. ordinary clear river or well water in 15 minutes.)

5. Add No. 4 to No. 3 (this will eliminate excess chlorine).
6. One fluid ounce of No. 5 to 50 gals. of water is sufficient (232).

Alcohol, Tobacco and Other Narcotics

Is alcohol a food? Shall the soldier and sailor use it? If so, how and to what extent? These are questions that have engaged the attention of the military as well as lay medical men for ages and the data are about the same from each source. We are not able to give specific answers to some of these questions, for the problem is a complex one and positive statements are not in order at this stage. However, such data as military men have obtained seem to indicate the limitation of the use of alcohol and alcoholic beverages to that of a medicine given only under the direction of a physician. Large amounts all agree are extremely injurious. It affects the character, health, and conduct of the victim, making discipline hard for the officers, increasing the burdens of an overtaxed medical corps, and reducing the fighting efficiency of the army. (116, 133, 259, 268, 363 n and p)

Russia, whose revenue has been derived largely from this source, has limited its sale and use to a great extent in even this, her time of dire need. Germany forbade the use of alcohol among troops at the time of mobilization. Practically every nation in the war has made some national prohibition with reference to its use. A nation-wide campaign has been made in England against alcohol and strenuous advocates even urged the government to control forcibly, perhaps to stop, the sale of it. (269, 270, 272, 273)

Naturally, much exaggeration abounds at such times, and reports without statistical basis should be accepted with hesitation—and then only in general when the character and

source of the statistics are known. For example, an English writer claims there is a "regrettable amount of intoxication" among the wives and dependents of the soldiers at the front and among the soldiers in training at home. He suggests, as the remedy, compelling the public houses (saloons) to open later, about mid-day, and to close earlier, about 8 or 9 p. m. The cause of this excessive use varies with different classes—the women of the better-off classes have a larger allowance which is spent for substitutes, for something better,—the women of the poorer classes have been thrown out of work, are idle, and drink to fill their time. "Recruits are being trained in large masses in locations where the opportunities for healthy recreation after violent and sustained exertion are few." The natural inference is that legitimate amusements, sports, and games should be provided. The civilian's habit of treating soldiers, and the soldiers' of treating each other, has proven as pernicious as treating always has among civilians. Lord Roberts made an earnest appeal to the people of Great Britain to avoid this.

Not the soldiers only are affected by drinking and drunkenness for it has been found that these habits interfere with those civilians engaged in the manufacture of the sinews of war, munitions, ship-building, transport industry. In England there exists, as in other European countries, a sort of tradition that drinking is an aid to industrial efforts. This has to be combatted. The fine, healthy specimens of manhood—the type of men who are temperate, who can control their appetites—have been called away, and thus the weaklings, the less efficient, are left at home. It is therefore all the more necessary to control the liquor business at home. Lack of munitions, etc., may prove as disastrous as lack of men, as was evidenced in the action of Teutons against the Russians in the summer of 1915. The factors mentioned may account for the temporary increase in the proportionate amount of alcohol used by those at home. Liberal wages permit of convivial excesses. It might, suggests one writer, be well to have prohibition of distilled spirits (in England). After a conference it

was urged that every one in England abstain from alcohol during the war, that efforts be made to provide all with necessary food, raiment, etc., and that proper recreation be furnished for the soldiers.

Dr. H. Lyon Smith points out that some claim that alcohol inhibits phagocytosis. He found this to be true where large doses were given (10 oz. for adult) but that small doses (2 oz.) distinctly increased phagocytic action upon common pathogenic bacteria (pneumococci, bacilli coli, streptococci, bacilli influenza). With a number of patients in whom anaphylaxis occurred, he found those treated with alcohol had either neutralized the poison, stimulated the development of antitoxin, or narcotized the nervous system for the time being. Therefore in the first stages of disease, the moderate use of alcohol will aid in the neutral resistance of the body to these germs. After the patient is thoroughly infected, it is of no use to administer alcohol. He recommends its use as a drug in amounts of about 1½ oz. daily. (233)

Sir Victor Horsley, who has done much work on this subject, objects to the recent re-introduction of the old English army rum ration. (Jan. 1915.) The results, he claims, of such a ration are: (1) decadence of morale causing carousing, friction, disorder; (2) drunkenness; (3) decadence of observation and judgment, giving rise to more errors and accidents; (4) loss of endurance and diminution of physical vigor; (5) loss of resistance to cold; (6) loss of resistance to diseases, especially those due to cold, as pneumonia, dysentery, typhoid; (7) loss of efficiency in shooting. ("Held rum ration causes a loss of 40 to 50 per cent in rifle shooting. The naval rum ration causes a loss of 30 per cent in gunnery shooting.") (95, 96)

Professor Parkes asserts that alcohol is not a perfectly reliable aid. One should have a knowledge of its full action before prescribing. It has been observed that the immediate effect of one fluid ounce of absolute alcohol is reviving but transient. After 2 to 2½ miles of marching and often before, there is a relapse. Its anæsthetic and narcotic effects then become more marked. Subsequent use gives a diminishing

return even in the way of apparent revival. In cases of extreme fatigue, where the heart needs it, the *physician* may prescribe it. He states that meat extract and coffee are better, as they really give strength. Some of the facts gathered from actual observation of troops under more or less controlled conditions are:

1. Entire abstinence from alcohol did not make men more sickly as a whole or more disposed to malarial fever.

2. The marching powers of teetotalers were good. . . .

3. The reviving effects of the rum when given at the end of the day was strongly (spoken of!) Under exhaustion after great exertion, alcohol will quicken the heart and act for a time as a restorative, though it may be hurtful or not useful during the *actual period* of *exertion*. The general feeling of warmth caused by alcohol and the temporary strengthening of the heart's action were also no doubt succeeded by a slight anæsthetic effect, making the sleep rather more profound.

4. The evidence of one or two of the men is that they marched better when rum had been issued on the previous evening.

5. Some of the evidence indicated the greater power of digestion given by the rum and the increased appetite given by somewhat changing the monotony of the food.

Alcohol, he states, is like a bill of credit which merely gives a man time to summon and marshal his reserve—he must have a reserve. From his long study of the subject, he suggests the use of alcohol only as a drug given under the physician's direction. (175, 176)

In his chapter on alcohol and other narcotics, Keefer has given data bearing on the use of alcohol. He describes the experiment performed in Sweden where 40 per cent fewer hits were made after a drink of brandy had been taken. (116)

Lelean gives the following facts: About 2 oz. of alcohol can be oxidized daily. There is from 1¼ to 2½ oz. of alcohol in the rum ration. On men accustomed to anticipating the grog at the end of the march, it has a psychic effect, perhaps lending zest to the closing work of the day. Alcohol's first effect is to stimulate the heart. It dilates the capillaries, aids digestion, and produces a comforting cutaneous sensation of warmth. Later it has a mild hypnotic effect. The dilation of the surface

blood vessels leads to an eventual loss of heat. The physiological resistance is lowered. Some animals normally immune to a disease will take it upon the injection of alcohol. (133)

Of the objections that may be offered to its use, he gives: the caloric value can be supplied better by cocoa, etc., which repair tissue as well as give energy—soup also is good for it stimulates digestion; the heat loss from alcohol is too great; its effect upon discipline is bad.

It should be issued only under the following conditions: *only* when there is no suitable alternative; *only* in special amounts after the day's work is done, and with the main meal just before turning in for sleep. Commerce in rum should be made unlawful except for those authorized. The buyer and seller should both be punished.

There are no such strenuous objections to tobacco. While it certainly confers no positive benefits, the degree of injury is small, perhaps counterbalanced by its psychic effects. Lelean points out that it has a tachycardiac effect, that it tends to muscular relaxation and to a diminution of visual acuity. He would limit the amount used to two pipefuls per day and prohibit cigarettes. (428)

Some Inferences from Data. German writers, teachers, and military men are urging upon the general public, and the teachers especially, that this is a most opportune time to impress upon the youth of the land the necessity of practising hygiene at all times. Now when the fatherland needs the best, when men are doing in the field, in the trenches, the things which it is desirable that children and grown folk do at home, it is quite easy to influence the youth in the formation of correct habits along these lines. That each may render to the state the best that is within him, he must be of sound body and mind. This means that he must eat, drink, exercise, dress, think, and sleep properly. He has the examples about him in the men who are giving their all for their native land. No longer is the use of alcohol a mere theme of agitation for cranks. It is vital to the state to regulate it to the extreme and even prohibit its use in places. These facts properly

placed before the pupils are much more convincing than moral discussions and typical temperance lectures. This will require real study of the problems involved, on the part of teachers. And that their instruction may have maximum influence they should practice what they preach. The leaflets bearing on food, clothing, exercise, treatment of wounds and disease will prove better texts and be better learned than the usual books on physiology, etc. Let the boys and girls at home plan and take part where possible in keeping the home and city conditions hygienic. Let them distribute literature and, better yet, let them form clubs such as Boy Scouts which train along such lines. They may thus come to feel that they too are shouldering their part of the responsibility for the welfare of the fatherland.

While these injunctions are particularly apropos for the nations at war, it certainly would seem that the opportunity for their most efficient functioning is in times of peace. The real preparedness for the struggle of life, whether it be war or peace, public or private, is made through the formation of correct habits of conduct during the plastic years. If instruction really functions, it would seem that the logical conclusion for pedagogy is that a large part of all our instruction should at all times be given under the same principle, namely, the actual training through action under conditions correlated with the home and civic environment of the child. (358)

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